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SMITHSONIAN DEPOSIT

Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

ACCURATE MEASUREMENT

OF

AIR AND STEAM SUPPLY

(PATENTED),

AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

PRODUCING { UNIFORM RESULTS. HIGHEST EFFICIENCIES.

THE AMERICAN
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INC.

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PRESIDENT YOUNG'S ADDRESS

TO THE NATIONAL COMMERCIAL GAS ASSOCIATION, AT MINNEAPOLIS, DEC. 1st, 1914.

Commencing with this meeting the Manufacturers' Section takes the place of the Manufacturers' Committee. The Association welcomes the formation of this section. It is encouraging to know that members who are manufacturers of apparatus and appliances are prepared to take additional interest in the affairs of the Association. The plan of appointing committees to work in conjunction with those of other societies where work has overlapped has been tried with apparent success. It seems to have a practical advantage, and, as a working basis, becomes more clearly established, such a procedure will no doubt prove useful to the industry.

The advantage of a central body preparing advertising literature in booklet form has been demonstrated by the success of "The Gas Equipment of the Home" booklet, prepared by a joint committee of the Pennsylvania Gas Association and this Association. There is a demand for booklets and other productions of a high standard for general and special distribution, and the Association should be equipped to provide such material. As a step in this direction a Booklet Committee has been appointed to supervise such production. The appointment of a statistican, authorized at the last annual convention, has been made, and his work is under the direction of the Chairman of the Central Development Bureau. His work has the possibilities of much usefulness, and this addition to the organization has greatly facilitated the work of the Association.

The Bulletin during the past year has kept the membership in touch with the work of the Association, and the committee in charge has made improvements that has been generally appreciated by the membership.

Your Board of Directors has met monthly, except in two of the summer months, and your President has made it a practice to visit the Headquarters of the Association Friday afternoons, meeting there officers, committeemen and others by appointment. The Association has been very much cramped in its quarters during the past year, but is fortunate in having found suitable new quarters and surroundings in the Adams Express Building, 61 Broadway, New York city.

No one can foretell the economic effects of the European war now being waged. We know that tremendous sums are being wasted, running into the tens of millions of dollars daily; that vast numbers of men are being withdrawn from productive employment, and that great destruction of property is occuring. On the other hand, the forces of economy are now causing the accumulation of capital elsewhere, and the resources at the command of man to-day are so great that it may be that the world will recover all that it is losing, in much less time than now seems possible, and again go forward in the march of civilization faster than ever before. The economic and financial disturbances resulting from the war have caused the industries of this country to pause in its progress. Their development has been rapid, but none the less sound for the most part, though it has been evident that some of those industries which economists have been accustomed to consider as subject to the law of increasing returns, are now apparently subject to the opposite law. Public Utilities have been thus classed, so it is of great importance that the public be taught to recognize the conditions that have brought about this change. The operation of utilities has been said to be governed by the law of increasing returns, because the application of additional capital brought more than a proportionate increase in product and return on investment; but the constantly increasing cost of capital, material and labor during the last 15 years has changed the situation completely. There is, therefore, less reason for believing that base prices for gas to the consumer can be reduced in the future, than that they will remain stationary, or must be increased. Probably gas companies are affected by war conditions the least adversely of all public utilities. In common with other soundly managed institutions they have carefully reviewed their resources, obligations and business opportunities under present conditions. They are fortunate, in such times as these, in supplying a household and commercial necessity; in the great number of their customers, and in the diversity of uses to which their product is put.

Gas plants can be operated without as large outlays of new capital as other utilities, and it remains for their operating and commercial men to employ their talents to meet the emergency. Especially to the commercial man does the emergency appeal. He must develop intensively the business of his company; striving first to bring in the business which requires the least proportionate outlay in capital, and generally to stimulate the greatest diversity of uses of gas in the community; by methods that will enhance his company's reputation for business sagacity and enterprise. This Association should never lose sight of the great importance to its membership of the study and development of selling methods. Its concentration on this work is one of the chief reasons for its success and its present influence. New markets can not be gained over night—careful preparation is required. A study of the needs of prospective customers is essential. Our product must be delivered to suit our customers' convenience. Habits and customs will not be changed to suit the seller. Our aim must be to make our service adaptable to the needs of the customer; at rates that are fair and just.

> **"Especially to the commercial man does to-day's emergency appeal. He must develop intensively the business of his company; striving first to bring in that business which requires the least proportionate outlay in capital, and generally to stimulate the greatest diversity of use of gas. * * * * *"**

The subject of rates brings up the question as to what is a reasonable return on investment in public utilities. It is important, from the standpoint both of the consumer and of the investor, that gas companies should be financially sound; and, therefore, rates should be allowed that are sufficient to provide at all times surplus earnings, under efficient management, in excess of a bare return on the value of all the property. Political expediency should not be allowed to interfere with the financial security of the property devoted to the public service.

Of first importance to the industry are the principles of law and administration under which gas must be manufactured, distributed and sold. It is highly desirable that the members of this Association

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should be familiar with these, with the theory of regulation as applied to public utilities; and with the economic principles which control the situation. It is important for the proper development of the use of gas, that regulation not only be done along well defined lines, but it should allow the incentive forces of the gas industry full play; and be consistent with true economic principles, rather than with untried theories that do not take experience into account. Constant pressure is likely to be exerted upon regulatory bodies by a public ignorant, very largely, of the effect upon public utilities of the application of unsound regulation; and it becomes a duty of the members of this Association, and the industry generally, to bring the public to realize the injury that will result from such measures; so that the pressure alluded to will not be exerted, and that regulatory bodies may be unbaised in their work—work which carries the possibility of being either one of the most constructive features of modern industry, or most destructive in its effects. It is encouraging that civilization to-day is striving to better the conditions which exist. It would indeed be discouraging if it were not—but it has been demonstrated, time and time again, that society cannot improve itself by destruction of its economic props. It is probably true that regulation, as we know it in this country, is about to pass from the formative and educative stage to the experimental stage. It should be the aim of every gas man to see that no sound principal governing the service for which he is responsible is violated by him. Remedies applied by governmental authority to unneccessary evils may cause greater evils or develop them where they did not before exist. No one can fail to appreciate the possibilities of good from the regulation of public utilities. The disadvantage of unregulated monopoly is too apparent not to invite the organization of properly constituted regulatory bodies, insuring; on the one hand, protectiou to the investor, and, on the other, adequate service at a reasonable rate to the user. Even a slight consideration of the functions of such bodies points to the desirability of their removal from the influence of local or factional control. It is of vital importance that their judgments rest on economic grounds, and give the protection to the investor that he is legally entitled to. It is unnecessary to elaborate on the development of the principles of valuation and of rate making that have been laid down by the courts and State and Federal Commissions. I only wish to emphasize that it rests chiefly with the public utilities to determine what kind of regulation they will be subject to. I have faith that regulation will be helpful eventually, if they do their duty to the investor, the consumer and the employe. It may be destructive if they fail in their duty to any.

The constructive side of public utility work has been given little consideration by the public. Attention has been focused on how to control and restrict the utilities. It is true that, in some cases, there has been abuse of public confidence, but the whole theory of regulation by competition and political agitation was wrong, and logically led to abuses. Regulation by semi-judicial bodies is infinitely to be preferred, but there is always the danger that the conditions under which business must be done will not coincide with what the regulatory body may decide should result from their application of economic theory to a going business. If business were an exact science there would be no difficulty about regulation. Unfortunately it is not, and we sometimes suffer from attempts made to make business coincide with preconceived ideas under conditions that are constantly changing.

I am an advocate of State regulation for public utilities, because some regulation and control is desirable; but it should be exercised wisely and with a view to developing the consciousness of responsibility on the part of public utility companies to the public as well as to the stockholder; for there is such a responsibility, and, perhaps, we are suffering in part from failure to recognize it. No community has prospered by restricting capital. It is impossible to coax capital by restrictions upon its employment. When this is clearly recognized there will be less argument as to how far regulation shall go. Neither must the management be restricted in the proper performance of its functions. It must retain control of its outgo and income if it is to successfully conduct its business. It must be left free to act upon its judgment in matters of business, so long as such action does not conflict with public policy. The obligations and the rewards should rest where they belong, and be distributed in accordance with sound business rules and not political theories. In our haste to correct surface distempers we are likely to disturb the roots of business. If investment of capital is not encouraged, capital will either go elsewhere, or will not be accumulated for investment purposes.

The benefits of a sliding scale of rates have been pointed to as a solution to this question. It is too soon to say whether it completely meets the situation, but some arrangement that will allow both the public and the investor to share in the benefits of good management and protection to the utility investment would seem to be just and fair, and would probably prevent the evils of over-regulation and eventual municipal ownership on the one hand, and unrestricted monopoly and competitive waste on the other.

Advocates of municipal ownership seem to find less attraction in gas than in other utilities. After some years of comparative rest from agitation, municipal ownership has again come to the front in public discussion; not because of any new principle discovered that bears on the situation, but, apparently, because the cycle has come around again. The same objections to municipal ownership and operation, political control, and consequent waste and extravagance and lack of responsibility on the part of municipal employees, obtain at the present time as when the matter was last before public attention. Anyone who has compared the operation of municipal projects with private projects in this country, can testify to the difference in efficiency of operation. This difference is the measure of economic loss. It is reasonable to suppose that if municipal credit were used for utility purchase and expansion, that the increase in the cost of capital for other municipal purposes would, in some measure, offset the higher costs of obtaining capital for privately owned utilities.

Taxation of gas properties, in the mind of the public, seems still to be the inexhaustible source from which contributions for the public welfare may be drawn without injury to anyone. It should be apparent to all that the consumer must eventually pay these taxes, but the danger is that before this is discovered, irretreviable injury to the utility may have been done, and excessive and extravagant expenditures on the part of the municipality be incurred.

This Association exists not only for its members but for the industry; and the efficiency of the individual as a unit has always been in the mind of the officers and directors. The educational work of the Association, to which so much disinterested effort has been devoted by many of our members, has been most successful. Nearly 4,000 students are now completing the course on the Utilization of Gas Appliances. A new 3-year course is ready to commence January 1st, which I believe will prove of very great value to all who take it. It is prepared particularly for commercial and office men, and I hope that appreciation of the work of the committee responsible for it will be shown by a large enrollment.

The membership has shown a healthy growth during the past year, but the advantages of membership are so great that the number is far short of what it should be. It is recommended that every effort should be made to encourage the formation of Company Sections and, if possible, to provide speakers or lecturers to visit the Sections during the year. Appropriate subjects for discussions should be provided at the sectional meetings and a social spirit encouraged. If the Association is to become the force in the industry that we all hope it will, it must be from the co-operation of all its members. If we believe that membership in the Association gives us an opportunity for helpfulness, and leads to the development of ourselves and our associates, we should use it for those purposes. The Association's activities must be stimulating, not merely reassuring in their effect. Members should be stimulated to surpass their former efforts and the efforts of others, not merely to equal them. The object of these collective efforts is of supreme importance. If they are merely for the sake of association aggrandizement, they will not be of lasting benefit. Their objctive must be in accord with the soundest business policy, and yet perfectly plain and susceptible of accomplishment. We should strive for the concrete and practical methods should be followed, rather than the more alluring speculative course. We ought to be so proud of our Association that we should dignify our methods by the true spirit of commerce and industry. Commerce will not thrive unless there is advantage to both buyer and seller. The true spirit of commerce is, then, advantage to all. How can it be brought about? Let us first educate ourselves, not merely in the gas business, but in the broadest possible way. Let us give an opportunity to every worker to train himself to be of greater value to himself and to his company, and through his company to the consumer and to the investor. Let us educate the consumer not only to burn gas, but to get the full benefit from its use; and to grant to the producer and distributor full protection and opportunity to serve him faithfully and with true economy, by the passage of wise laws and economic regulations. Let us educate the manager, so that he will see the true relation between the company, the employee, the consumer and the investor, and act accordingly. Let us educate the employee to do his full duty to himself and to his employer.

The finances of the Association are in good condition. During the past year the Association has purchased five $1,000-bonds of the

Brooklyn Union Gas Company, with the idea of making this a nucleus of a special fund, the income of which can be devoted to educational and kindred purposes. I recommend that a plan be formulated to accumulate a fund of $50,000 for such purposes.

At the mid-year meeting of the Association a most instructive series of papers on industrial fuel topics was discussed in separate session, and the same plan will be followed at this meeting. It is hoped that before the end of another year the Association will have an Industrial Fuel Expert, to assist the smaller companies in developing such business, and to gather and collate information now scattered and not generally available, and so enable every situation to keep in touch with all the developments in this important field. The work of such a man would be largely self-supporting, for requests are often received for such service.

Many Presidential addresses have emphasized the importance of the lighting business. The earlier President's characterized the attitude of gas companies towards it as one of neglect. It is reassuring to be able to say that such a word cannot be used to describe the situation to-day. The field is not neglected, but is it being properly developed? There seems to be room for increased activity. The advantages of gas lighting are apparent. Such favorable qualities as its competitors possess are surely balanced by its advantages. The situation only requires aggressive action on the part of gas companies to preserve and increase this business. Nor should it be lost sight of that the use of gas for lighting stimulates its use for other purposes. The papers and reports of committees on lighting matters, which will be presented to you, should help to bring about a more progressive policy by gas companies in regard to lighting.

The use of gas for heating is a field of vast possibilities. Conditions are making the marketing of gas for this purpose more and more feasible. The cost of labor and other fuels is continually increasing, and conditions in cities tend to make the use of solid fuels objectionable. The recognition of the desirability of radiant heat is becoming more general, and the increase in wealth of the community is increasing the market value of convenience. If conditions continue to move in the same direction, and the development of gas-heating appliances continue to make the same progress as in the last few years, it is safe to predict that we are on the threshold of a great increase in the use of gas for heating. I wish to draw particular attention to the report of the Committee on Heating, Ventilation and Refrigeration, which deals with this subject.

The study of rates for gas service throughout the country shows that there is an opportunity to very extensively increase the sales of gas at profitable rates, particularly for industrial purposes, if differential features are provided in the rates charged. A committee of the Association is to present a report on differential rates, which deserves your serious attention.

There is not time to refer in detail to all the reports and papers which are to be presented at this meeting, but they are all of worth, and I bespeak for them a full attendance at their presentation. The Exhibition needs no commendation from me. It confers great credit on the Exhibition Committee and exhibitors, and commands the interest of every member.

I wish to acknowledge the splendid co-operation of the officers, directors, committeemen and members during the past year, and the faithful service of the office organization.

THE CARE AND MAINTENANCE OF GAS HOLDERS.

WHERE TO LOOK FOR CORROSION. HOW TO REMOVE AND PREVENT IT. PROPER INSPECTION.

[From the paper by J. H. BRAINE, prepared for the Ninth Meeting, American Gas Institute.]

The object of this paper is to treat from a practical standpoint the care and maintenonce of gas holders. It does not purport to be solely an expression of the writer's views, or the experience of any one company; it is an endeavor to treat the subject comprehensively, embodying the experience of some of those best qualified to deal with the matter.

In caring for holders built of good old fashioned iron, we have a comparatively simple problem, as it is certain that this old iron is much less vulnerable to corrosion than modern steel, whatever the relative powers of resistance to rust of modern iron and steel may be. The care of more modern steel holders, built within the last 20 years, is a much more serious problem, and it is mainly to sound a note of warning regarding these that the first part of this paper is written, in the hope that some may, by a little attention now, be saved heavy repairs in the future.

Corrosion.—Gas holders, and holder frames, are peculiarly susceptible to the destructive action of rust. Many theories as to the cause of rust or corrosion have been set forth, Friend mentioning five:

1. Simple Oxide Theory.
2. Acid Theory.
3. Electrolytic Theory.
4. Hydrogen Peroxide Theory.
5. Biological Theory.

It is generally conceded that the electrolytic theory is the most tenable, and much experimenting and laboratory work with protective coatings, improvements in the manufacture of metals, etc., have been carried on with this theory in mind. It is, of course, necessary for us to know the cause of such a destructive action as corrosion, and it is hoped that manufacturers of steel and iron and preservative coatings, will soon have definite data.

The following is from a paper read by Dr. G. W. Thompson before the American Institute of Chemical Engineers, 1910:

"By corrosion of iron and steel, we mean the oxidation which takes place at ordinary temperature, with the formation of rust. Rust approximates the formula: $Fe_2O_3.3H_2O$.

"A very important consideration in connection with the formation of rust is that the specific gravity of iron is 7.80, and that of rust about 3.70. If the iron and the rust are strictly pure and of theoretical composition the iron shows an increase in volume in conversion to rust equal to 336 per cent.; that is, 100 volumes of iron become 436 volumes of rust.

A sample of rust, obtained by exposing a piece of steel, which has been pickled to remove scale, etc., analyzed as follows:

	Per Cent.
Hygroscopic moisture	8.83
Combined water (including CO_2 0.17 per cent.)	21.45
Ferric Oxide (equivalent to iron 48.28 per cent)	68.97
Silica	0.26
	99.51

"The material factors in corrosion are air and moisture, and their action is accelerated or retarded by other factors.

"The tendency of iron to corrode has been considered to vary with the composition of the metal, but, apparently, facts do not warrant this conclusion to an extent that would justify general dependence on a purer and more expensive metal as against a cheaper metal. Nevertheless, corrosion in the form of pitting is unquestionably due to the greater tendency of the pitting parts to corrode than the adjacent parts. Such corrosion is said to be due to a higher electrolytic solution pressure, compared with the adjacent parts, and the corroding area is said to be electro-positive to the surrounding area.

"The corroding operation is supposed to be, first, a solution of the iron in water, and second, the oxidation of the dissolved iron by air, with the formation of ferric hydrate or rust, This solution could not take place without water being present, nor would oxidation take place in the absence of air. The solution of the iron is accelerated by the presence of carbonic or other acids and neutral salts, also by substances which are electro-negative to iron. Corrosion is accelerated by substances or conditions which increase the amount of moisture on the surface, as by hygroscopic substances, such as rust itself, or a moist atmosphere."

The following are the views of an engineer of wide experience with structural metals and gas holders: "Arresting the decay of iron structures of all kinds and especially gas holders, is a problem of much interest.

"The general accepted theory of corrosion is that it is due to an electro-chemical phenomenon, or to an electrolytic influence, not necessarily induced by stray electric current, but due to the construction itself, and unfortunately, in many instances, this construction cannot be altered, as witness the cups of a gas holder. Iron or steel is a metal which finds no difficulty in combining with or

dissolving a number of other elements, and it is known that minute quantities of impurities in the mass are sufficient to greatly alter the physical characteristics: these are manganese, phosphorous, sulphur and carbon. One of the principal difficulties in the manufacture of steel is due to the fact that these impurities are not homogenously distributed, and that when the mass cools, segregation takes place, and the steel no longer maintains a unit character throughout its mass, one portion containing more or less impurities than another, it is not a homogenous pure metal.

"Owing to the general pollution of the atmosphere and of the water which comes in contact with metal, the problem of dealing with corrosion is greatly increased. The sulphurus acid carried into the atmosphere, and stray electric currents are probably the chief stimulants of corrosion. Electrolysis takes place when an electric current passes through any solution; and this may be produced without the aid of any stray current. For example, place two different metals in a solution, the metals connected by a wire at the top, and note the electric current which immediately flows through the circuit formed. The iron or steel of to-day in its segregated structure, presents sufficient dissimilarity to produce the above mentioned conditions.

In the first stages of corrosion, ferric-hydroxide is formed on the surface of the metal by electrolytic action; this compound being insoluble and gradually falling off as a red precipitate. The precipitation removes a portion of the metal. It is not necessary that the iron be dipped into water, a thin film of water on its surface will suffice in that it tends to dissolve the metal. When an atom of iron passes into the water, it is charged with positive electricity, while the mass of iron from which it has been separated is charged negatively, and so continues until the electrolytic tension becomes of such magnitude that no more atoms can be separated. If the water should contain ions of some other metal which is subject to a lesser solution pressure than the iron, the above action will be reversed; thus placing the iron under the original conditions, and permitting further interchange of polarity, with consequent solution of additional atoms of iron in the water. The impurities in the iron are in themselves capable of setting up this second action. Iron will rust in the presence of pure water and oxygen, without the addition of acid, and as pure water contains free hydrogen ions, the iron probably dissolves through interchange with the hydrogen, and to this extent becomes an acid. This points to the fact that the rusting of iron is not primarily due to the oxygen, but to the hydrogen ions.

"Manganese not exceeding 1 per cent. is conducive to corrosion because it reduces the iron's conductivity, and if sulphur is present the condition is aggravated, as manganese sulphide is formed, which in turn is oxidized by the oxygen in the water, and sulphuric acid and manganese oxide are the resultants, permitting the sulphuric acid to act locally wherever manganese oxide is found. The process of oxidation does not as a rule take place at ordinary temperatures unless moisture is present, and in order to prevent it moisture must be excluded.

"If electrolytic action could be obviated, corrosion would not take place, but the manufacture of steel or iron has as yet not reached that stage of perfection which will preclude those inherent qualities which produce this condition. * * *."

The iron used by the ancients was much less subject to decay than present-day material. Many examples of such iron have been brought to our attention by travelers, and some specimens are still performing their functions.

A quotation from Cushman & Gardner's "The Corrosion and Preservation of Iron and Steel," will be appropriate here:

"Sang says as follows: 'Carelessness of manufacture, which tends to heterogeneousness, is an invitation to corrosion, and in itself goes far to explain why modern steel, tortured into shape at such a high speed that the molecules are not permitted to readjust themselves, is more corrodible than the metals produced a generation ago. The internal strains due to mechanical treatment are not to be confounded with the unevenness in the distribution of impurities due to segregation in cooling; these mechanically induced strains are really equivalent to straining the metal beyond the elastic limit, which makes it more corrodible. Moreover, the tonnage craze, from which the quality of product in so many industries is suffering, is placing on the market a mass of material, only a small proportion of which is properly inspected, and which is not in proper condition to do its work:—rails and axles which fail in service and steel skeletons for high buildings which may carry in them the germs of destruction and death. No thoughtful person supposes that it would be possible to return to the earlier laborious methods of iron manufacture, in order to produce metal highly resistant to corrosion. The problem must be solved by modern economic method, and there is no reason to suppose that great improvements will not be made in the quality of both iron and steel, as soon as the principles governing the rate and kind of corrosion which takes place on different types and kinds of iron are thoroughly established."

It is interesting to note, in connection with the above, that some holder designers recommend a steel containing about 2 per cent. of copper; and also that in one holder recently completed, the sections are of iron, analyzing 99.8 per cent. pure, and the guide frame and tank of open hearth steel. During the construction of this holder it was necessary to replace a number of sheets rejected by the inspector, and steel sheets were substituted. These sheets were marked, and their resistance to corrosion compared with the neighboring wrought iron sheets will be interesting to observe.

General Conditions Found by Inspection.

The general belief as to the more or less indestructible nature of metal structures, will be upset by a close examination of the light frame work and sections of modern steel gas holders. A casual inspection shows them apparently in good condition, but careful scrutiny will show their extreme susceptibility to corrosion. These remarks apply particularly to damp climates and near the sea coast; in high altitudes and in dry air there is less danger. After once starting, however, rusting continues at a rapid rate, even in dry air, owing to the porosity of the rust, and its consequent retention of water. The rate of corrosion may vary greatly in different structures, and even in different parts of the same structure, due to the different parts of the structure having metal of different composition.

Faults in Design.—The design of some comparatively modern holders, in the possibility of protecting them from corrosion is astonishing, and shows that the perishable nature of modern steel was not given due consideration.

"* * * Within the last few years, we had occasion to inspect 63 gas holders, some erected as far back as 1853; and I will give a description of their condition."

Holder Proper.—"In some of the very old constructions, the holder shells and crown were almost completely gone, and the cause could not very well be established, although from later investigations, it appeared that decay originally began at those parts which were periodically in contact with water; and proper precautions not having been taken to remove this original evil, the decay crept from sheet to sheet until the entire structure was affected. When it is remembered that with a gas holder, conditions exist which do not pertain to any other structure; a period of suspension in the chemically foul water of cups and tanks, and the emergence of the holder covered with water into the hot, and at other periods cold atmosphere, it is remarkable that the material did not decay much earlier.

"Later constructions showed deterioration at the cup and grip sheets, and, if not properly cared for, on the sheets next to cup and grip, at the vertical legs where they were attached to the shells; under and around the carriages and rollers, and between the shells and outer friction plates. The holder plates decayed through the action of the water inducing electrolytic action, but the material under the carriages could have been protected, and the friction plate construction was bad, as if moisture once entered between the plate and the shell the damage was done, and it became only a question of time when the material in contact under the plate was compelled to decay, as there was no means of arresting this action after it was started. The connection of vertical leg to shell was probably affected through the shell material itself, as the decay here quickly induced the same condition in the surrounding material.

"Other causes of decay were very thin metal, which prevented caulking sheet to sheet, and necessitated some sort of joint material between the plates. This joint material, by the action of time, gradually disappeared, and left openings for the admission of moisture, and the entire material became affected, as the point of attack was so located that preventive measures were of no avail."

Guide Frames.—"The guide frames of the very old holders were usually cast iron columns, with steel or cast iron girders, wind ties not having become common owing to the small size of the holders. Invariably the bolts in the joints of the columns were rusted out, and as the columns were open at the top, rust formed on the inside with consequent deterioration. The girders were usually bolted to the tops of the columns and here also, due to the accumulation of dirt, moisture entered with the usual result.

"In the constructions prevalent up to a few years ago, the guide frames were of a multiplicity of parts, and the girders as well as

the standards usually provided with cover plates. These latter were a great source of annoyance, as moisture usually penetrated between the members and corrosion immediately followed, the construction precluding the possibility of cleaning and repainting. Instances have come under my observation which showed an accumulation of rust from 1 inch to 1½ inches thick, causing the cover plate to belly out between the rivets, at times to such an extent as to shear off the rivet heads. The method of connecting the girders and diagonals to the standards often form pockets for the deposit of dirt, and rivets were forced out of connections, and the structure thereby greatly weakened.

"The shape of the material used was at times not well chosen, especially in the great amount of lattice work usually employed in early constructions, each joint in such a structure being an exceptionally advantageous point of attack. It was also noted that, in many instances, rivets did not fill their holes, and consequently after the frame had been subjected to the racking effect of wind storms, the rivets would work loose, opening up points of attack, which could not be detected by the usual casual inspection. This condition was accentuated where bolts were used in connecting the members of the frame.

Steel Tanks.—The tanks were least affected by corrosion, probably because there were less joints open to attack. The top shell sheet at the water line, with the tank rails at the same level, are the points where corrosion is usually found first; the coping is also subject to attack, if water is permitted to accumulate and remain on the plates. Loose rivets, producing weeps, are also points of special attack, and unless caulked, may lead to serious consequences. The method of connecting the standard supports to the tank shell in the older construction produced considerable corrosion, as this joint was generally of such a nature that dirt would accumulate and absorb moisture. The bottom curb and outer edge of the tank bottom, where it rests upon the foundation also are points of attack, if not cleaned and protected. * * * ."

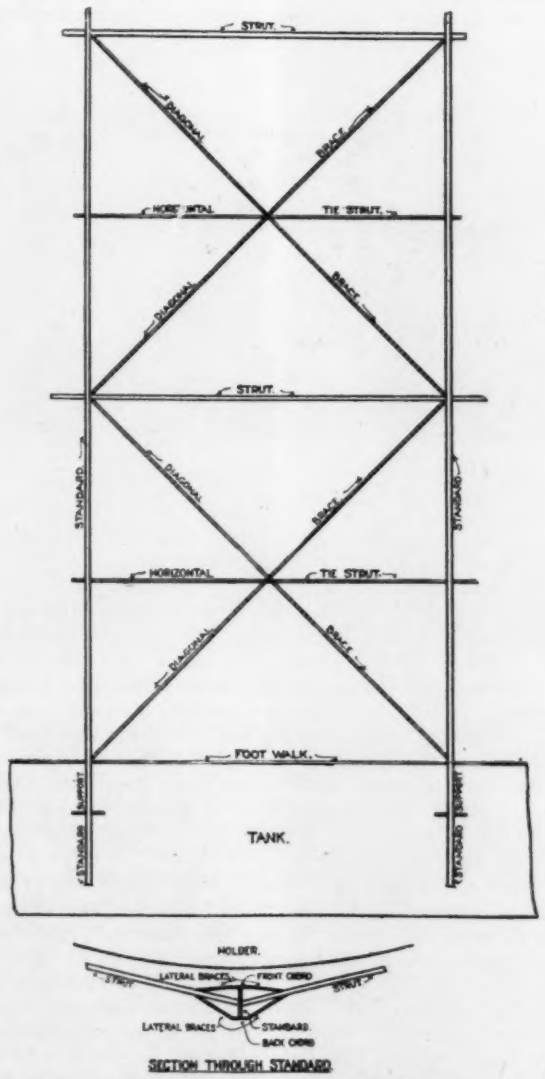

Fig. 1.—Gas Holder Frame Parts.

A number of instances have been taken by the writer illustrating where corrosion may be looked for; and notes covering remedies applied in the various instances. In order that the references may be clear, the names of the various parts of the frame work are given in Fig. 1.

Standard Supports.—In numerous instances, the standard suppart is secured to the tank plates by two Z bars connected to the front chord of the standard support, thus leaving an inaccessible pocket of space, with a depth corresponding to that of the Z bar, and width of front chord of standard support. This condition is illustrated in Fig. 2, showing a 5,000,000 cubic foot holder built in 1904.

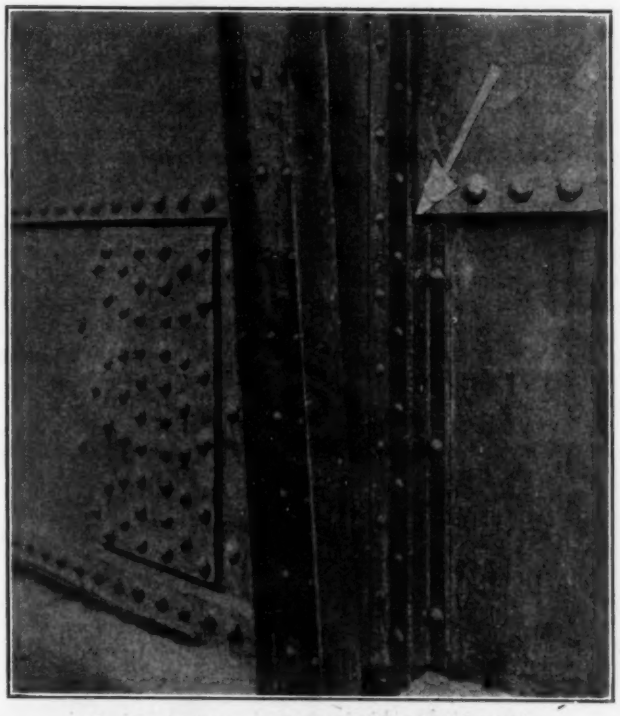

Fig. 2.—"Z" Bar Attachment of Standard Support.

In many instances the bottom of these Z bars is embedded in the concrete and the space filled with sand, roof cement, paint skins, and any one of a dozen different compounds, all of which shrink away from the metal, allowing air and moisture to enter and corrosion to go on.

These pockets should be cleaned out at any cost, and the metal surfaces cleaned and painted. It may be necessary to cut hand holes in the web of the Z bars, but it has been found possible, in some cases, to clean out the space and to scrape out the inner surfaces by means of a piece of wire cable with the strands turned up to form a rough brush; after which paint can be applied by drawing a swab back and forth by lines operated from above and below. Standard supports have also been found corroded where they enter the concrete or brick guard walls. This is taken up later under the head of "Tanks."

In the older type of steel tank holders, a cover plate was frequently used on the back chord of standard; and no regard appears to have been paid to the pitch of rivets necessary to secure the plate against buckling. The condition shown in Fig. 3, taken from a 1,500,000 cubic foot holder built in 1892, has, of course, been in-

Fig. 3.—Buckled Cover Plate.

creased by corrosion, but undoubtedly existed to some extent ever since the assembling of the guide frame. There does not appear to be any remedy for this condition, other than the renewing of the plate and inserting additional rivets.

Tank.—It has become general practice to surround the part of steel holder tanks below grade with concrete or brick walls.

" * * * The action of the metal of the tank behind concrete protective walls, as well as the action of the iron embedded in the concrete, cannot at present be spoken of authoritatively, as the use of these walls is only of recent years. The concrete should be placed directly against the tank shell, not leaving any space, and if voids are found they should be filled with asphaltum or some other such compound. The caustic lime in the cement should be a preventative of corrosion, for as stated above, iron in an alkaline solution will not corrode, but it will only remain so as long as the cement retains its caustic properties. As soon as the cement absorbs carbonic acid from the air, the caustic lime is converted into insoluble carbonate of lime, which induces corrosion. Therefore, it is necessary that the concrete be brought into perfect contact with the metal, and the concrete covered with a protective coating, as the absorption of the carbonic acid may cause the concrete to recede from the metal and thus permit moisture to enter."

It has been found that these walls do not remain in intimate contact with the steel tank, a considerable space appearing between the concrete or brick wall and the steel wall after a short time. The result on one steel tank is shown in Fig. 4, a 5,000,000 holder built in 1904.

Fig. 4.—Corrosion of Tank Plate.

Some designers prefer the guard walls to stand away from the steel tank, allowing a space for inspection and painting the steel. In the annular space between tank and wall, water will accumulate during storms and will in time disappear by absorption and evaporation. This constant change of conditions will be a very severe test upon any paint, and the bottom courses of the tank and the bottom curb angle will need frequent and careful attention to prevent serious corroding.

Notwithstanding the comparatively small amount of corrosion, disclosed by examinations of tanks behind guard walls, it was considered advisable to check this, if possible, and the following method was resorted to:

So-called "elastic cement" was used, furnished by a well-known manufacturer, and about three barrels were found sufficient for a 5,000,000 cubic foot holder. The cement was heated until about the consistency of molasses, but not allowed to boil, as this destroys its elastic qualities. A "V"-shaped space is cut in the top of the masonry wall next the steel tank, and the cement poured therein until it takes its final level. Several applications can be made, the cement bonding after a few days. The tank wall and the masonry wall must be perfectly dry when the cement is applied, otherwise the bond between the masonry and the steel tank will be defective, allowing moisture to get in. Experiments were made with pitch or asphaltum spread over the top of elastic cement to keep it from creeping. In the writer's experience, this has not been necessary and no protection over the elastic cement is used.

For brick walls, two methods have been resorted to: The top of the annular space is filled with elastic cement in the same way as for the concrete wall; and in addition, holes are drilled at points considerably below grade and cement grout forced in under pressure until it shows at the top of the walls. This is done because there is no assurance that the brick walls are air-tight.

This elastic cement remains permanently plastic. The chemist's report on this compound is as follows:

	Per Cent.
Insoluble matter, principally lead sulphate, $PbSO_4$	25.67
Iron oxide, Fe_2O_3	36.88
Calcium sulphate, $CaSO_4$	19.42
Calcium carbonate, $CaCO_3$	0.59
Magnesium carbonate, $MgCO_3$	14.07
Undetermined	3.37
	100.00
Solid matter (as above analysis)	88.04
Oil vehicle (nature not determined)	11.96

Test of this Compound.—A piece of iron pipe was polished and coated with cement. It was then treated with hydrochloric acid and the compound scraped off. The coating protected the iron from the acid, indicating that it is an efficient protection against corrosion.

Frequent examinations of this compound, after application, show it effectively sealing the annular spaces.

Guide Frames.—Many guide frames of comparatively recent construction have horizontal tie struts formed of angles connected by lattice bars. In many instances, the ends of lattice bars extended several inches beyond the rivet, under which projecting end corrosion begins spreading along lattice bar where it is in contact with angle, distorting the bars and making the cutting out of rivets, cleaning of members, and straightening and replacing necessary. In replacing the lattice bars, the projecting ends should be cut off, leaving just sufficient metal to give the rivet proper strength. This condition is shown in Fig. 5, taken from a 5,000,000 cubic foot holder built in 1904.

Fig. 5.—Corrosion of Projecting Ends of Lattice Bars.

Another frequent cause of corrosion are the pockets formed by diagonal members of the open type of standard. Often these members are channels, and on alternate tiers they are framed into the back chords of standards with flanges towards the web of I beam forming the chord. As the standards narrows toward the top, these diagonal members form an acute angle with the back chord, making a deep, narrow pocket, impossible to properly clean. In some instances, this pocket is filled with a cast iron wedge shaped block, which retards, but does not entirely prevent rust. In cases where these blocks were not installed, corrosion attacked the channel from the inside, hammer tests developing the thinness of the metal, the outside being still coated with paint, and the member apparently intact. This condition is shown in Fig. 6, from a 5,000,000 cubic foot holder, built in 1903. Replacing the member seems to be the only remedy.

Foot walk plates have been found with insufficient rivets, where the plate is fastened to the horrizontal member supporting it, rust forming at these points and forcing the plate up. Additional rivets between existing rivets have been found necessary. Small pockets in the frame work, between the butting ends of members have been found badly corroded. All edges of plates, members, etc., particularly where edges are vertical, are found to corrode and spread. Caulking these vertical joints is advisable.

The ends of diagonal braces, beyond the last rivets, have been found corroded underneath. This forces the member up, and endangers its stability. This can be arrested by using a thin scraper or hack saw blade.

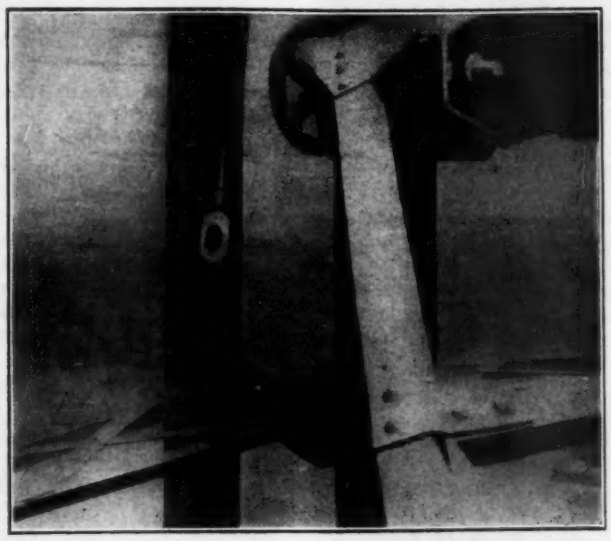

Fig. 6.—Pocket Formed by Diagonal Member.

Corrosion will also be found at intersections of diagonal braces, particularly if plates are inserted between them. When the diagonal members are round rods, it was customary to use ornamental junction plates of cast iron. In many instances the rods were found very badly wasted under these ornaments. It is advisable to remove all ornaments not necessary to stability. In some instances flat or angle shaped diagonal braces, badly corroded, have been replaced with round rods and turn-buckles. Brackets holding guide rails on standards frequently have fillers behind them, and in many instances are forced out of allignment by rust.

Carriages.—In many early holders, no provision was made for draining the carriage bed plates, especially in top carriages. Fig. 7,

Fig. 7.—Enclosed Carriage Bed Plate.

from a 1,000,000 cubic foot holder, built in 1890, shows a carriage which is a completely enclosed box section. Examination showed the crown sheets to be badly wasted, so hand holes were cut and drain holes drilled in the carriages.

In a number of instances, on holders built even within the last few years, counter-weights were placed inside the goosenecks of top carriages. Their presence was not reported, and, when finally removed, the crown sheets were considerably wasted by corrosion. When such weights are used it would be well to carry them in a frame clear of the crown sheets.

Many older-type holders with stayed crowns had very light crown sheets. These light plates buckled between points of support, leaving a subsided area for the accumulation of water, dust, cinders, etc. The practice of filling these depressions with paint skins, or roofing cement, has been found very dangerous, as moisture gets under the filler, and sheets are badly corroded. This condition is illustruted in Fig. 8, from a 500,000 cubic foot holder, the date of erection not known. These depressions should be kept clean and frequently painted.

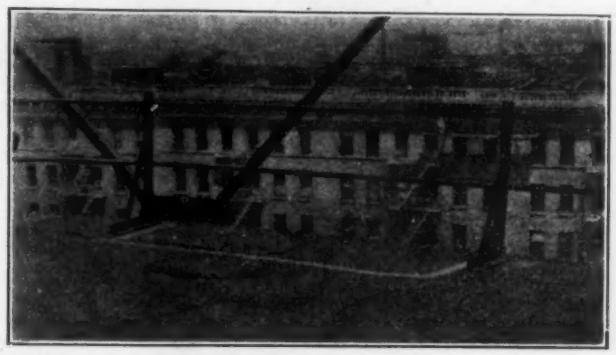

Fig. 8.—Corrosion at Low Spot in Crown.

Sections.—One of the most serious conditions with which we have to deal is the way the vertical legs or stiffeners are attached on holders built more than two or three years ago. These legs are frequently channels attached to the outside of sections by two angles. The inequality of surface, caused by the overlapping plate, is compensated for by thin fillers under retaining bolts, and the spaces thus left between the legs and the sheets of the sections harbor moisture and dust, and promote corrosion.

This condition is illustrated in Fig. 9 from a 3,000,000 cubic

Fig. 9.—Space Between Vertical Leg and Section Sheet.

foot holder built in 1903. It is possible, in many cases, to clean these spaces with a thin scraper, and paint by means of strands of lampwick dipped in paint or red lead and forced into the space with the scraper.

As a general proposition, pockets and all places difficult of access on tanks, guide frames, and sections of holders should be freed of all roofing cement, putty, paint skins, and any other filler, and thoroughly cleaned and painted, as none of the substances heretofore used have been found to entirely exclude air and moisture. The drilling of drain holes in pockets will be found to largely prevent corrosion; and is also effective in preserving footwalk plates, as they buckle and allow water to stand after a rain. The points can be marked immediately after a rain, and holes drilled later. There are some cases where the pockets in frame work are so inaccessible that their filling with some sort of protecting compound is necessary to prevent them filling with water, dust, and cinders. Be careful in selecting the compound. Inquiry develops that at least one well-known paint manufacturer has a compound designed for waterproofing decks of bridges, viaducts, etc., which is of such a nature that cracks or breaks caused by abrasion, or distortion of the structure, "heal" automatically, thus allowing the compound to resume its function of protecting the structure from air and moisture. There are instances where its use on holder framing would be an advantage.

Hand Rails.—On many holders, hand rails are of ordinary gas pipe, supported by cast or malleable iron stanchions. In many instances, gas pipe hand rails have been found corroded away at the threads, which are sometimes cut extra long to serve the purpose of unions or long screws, and breakage of railing, cast or malleable, supports have occurred. In such cases, it is advisable to replace railing supports with angles and form the rails of solid bars.

(*Continued on page 362.*)

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NEW YORK, MONDAY, DECEMBER 7, 1914.

MINNEAPOLIS CONVENTION.

McLean Next President—Next Meeting at Washington—Show Large and Practical.

[Special Report by Telegraph from Staff Correspondent.]

The Armory, Minneapolis, was the scene of a happy gathering on Monday evening, November 30th, for there the President of the National Commercial Gas Association, Mr. Percy S. Young, welcomed the members and guests to the Tenth Annual Convention. The entertainment was principally vocal, although the dancing exhibition was much enjoyed. Following the formal program, dancing and refreshments were in order.

Tuesday Morning Session.—The business side of the Convention was started without unnecessary preliminaries by the President introducing Mayor Wallace G. Nye. His Honor outdid himself. No perfunctory "Key-to-the City" platitudes, but a splendid address. The response by Mr. E. N. Wrightington was followed by the only change in the set program. On account of the absence of Mr. J. J. Hill, Mr. E. W. Decker, President of the Northwestern Bank, delivered an address, which was responded to by Mr. Thomas N. McCarter in his usual forcible style. The rising vote of thanks to the speakers, proposed by Mr. W. H. Levings, was given in true Seventh Inning Style.

The reading of the minutes of the previous meeting being dispensed with, the Directors' Report was heard. This called special attension to the valuable work of the 36 committes, and the vast amount of work accomplished in the office of the Secretary, the increase in the work, and need of more room necessitating the removal of Headquarters to the Adams Express Building. Good work has been done by forcing the modification of extravagent claims of some advertisers, and thereby protecting the public. The National Advertising Campaign, started last July, has focussed the attention of the public upon the gas company, and has assisted in promoting a better mutual understanding between the companies and public. The generous support of all the gas companies is urged in order to continue this work successfully. The work of the Board of Educational Control was praised, and its success seems indicated by the large percentage of students completing their work (over 50 per cent.). The new 3-year course is expected to be even more successful. "Service cannot rise higher than its source and the employee must be trained." The sale of the booklet, "Gas Equipment for the Home," has reached 50,000 copies. The Directors' Report was accepted and referred to the incoming Board for action.

The report of Treasurer McLean showed a fine financial condition; $52,000 having been received, and a balance of $6,000 being on hand. The advertising fund showed receipts of $51,000, and an unexpended balance of $15,000. The report of the Finance Committee showed all of the activities well taken care of. The report of Chairman W. J. Clark, on Amendments to the Constitution, recommended that the Board of Educational Control be increased to 18 members, to serve 2 years; and other minor changes. All were adopted. The Committee on Public Policy made no report.

The report of the Membership Committee, read by W. H. Pettes, showed a most healthy condition; 622 new members were enrolled during the year, bringing the total up to 2,828. There was an increase of 46 Company Members, making a total of 315. The Committee recommended that the Association employ a traveling representative to organize sections and exploit the educational features. The adoption of this report seemed wise after the meagre statements of the Committee on Company Sections.

The Presidential Address of Mr. Young was an unusually strong exposition of the work of the Association, and was received with marked attention. Messrs. Wrightington, Doty and Bennet will report on it later.

The report of the Nominating Committee was accepted and the Secretary cast a ballot for the ticket named:

President—H. B. McLean.
First Vice-President—L. F. Blyler.
Second Vice-President—W. M. Crane.
Third Vice-President—Will W. Barnes.
Secretary—Louis Stotz.
Treasurer—W. J. Clark.
Directors—J. B. Myers, E. G. Reed, S. T. Willson, B. J. Kellum, Arthur Hewitt, T. M. Ambler, and J. J. Burns.

Mr. W. J. Clark escorted the new president to the chair amid great enthusiasm. He accepted the honor in his usual terse style, and asked for the same spirit of co-operation that had been accorded his predecessors.

The place of next meeting was not decided so easily, as San Francisco made another gallant but futile effort. It was finally decided to go to Washington, D. C., the first week in December, 1915.

Tuesday Afternoon Session.—The afternoon session opened with the report by Mr. R. R. Young on "Relations with Customers", which covered the subject in a most comprehensive manner. Some idea of its scope can be gained from the fact that it occupies nearly 150 pages, and contains copies of forms for every department doing work for the consumer. It was discussed by Messrs. Stannard, Hare, Hewitt, James, Halsey, Martin, Dodson, Ewing, Dunn, Macbeth, Ware, Pettes and others; covering mostly minor points, but all were agreed as to the value of the paper and the importance of having employees familiar with its contents.

The Standardization Committee report, read by Mr. O. H. Fogg, was short and to the point, treating mostly of cocks and valves. The gas fixture specifications presented at the 1913 meeting, were made part of the report and adopted with it.

The Salesman's Handbook Committee reported, through Mr. E. C. Bartlett, that they had received replies from only one per cent. of the companies whom they asked for data. Mr. Macbeth said that this indicated that the companies did not want the book. President Young said that it was too important to drop, and on motion the Committee was continued for another year.

The final work of the session was the consideration of report on Booklets. Chairman J. Arnold Norcross eloquently pleaded for more booklets and better booklets, especially on Lighting as they have a great value in educating the public. Booklets were also recommended on Store and Show Room Heating, Hygienic Value of Gas, Industrial Uses, etc. Mr. J. P. Hanlan read a discussion by Mr. L. R. Dutton; following which the session adjourned.

Wednesday General Session.—Business management has characterized the sessions, as might be expected with President Young in the chair, assisted by Secretary Stotz; and Wednesday's session, which began promptly at 2 P. M., was no exception. "How to Select, Train and Hold Your Sales Force" proved a lively topic to start the meeting, and the thoughts of the author, Mr. C. H. French, based on long and varied experience, brought out as many ideas as there were speakers. J. B. Myers said employees should be promoted for merit, and that the company should give all possible assistance; very young men were not as useful as older men. J. P. Hanlan would apply the Golden Rule. G. N. Stannard mentioned some broad principles; select only the enthusiastic and industrious. T. M. Ambler said none but very broad rules can be laid down; rely on your knowledge of human nature to size up an applicant. H. K. Dodson thought the selection of men the most important work of a Commercial Manager; the best salesmen are those starting with a company in minor positions. G. E. Smith says send out all new salesmen with old salesmen for a couple of

weeks, to teach the newcomers about the general stock. F. R. Barnitz thinks the wage question the one with which to hold salesmen. R. R. Young cautioned against employing timid salesmen, and advised putting good salesmen on salary and commission.

After Mr. French closed the discussion, Alan R. Fernald talked on Direct Advertising. He said, in preparing direct advertising you must consider distribution, suitability, general appearance, copy, and cost last. He dwelt on advantage of preparing the mind of prospects and those inclined to be negative; and particularly on courtesy. Mr. R. C. Fowler's report of Publicity Committee, which followed, presented valuable suggestions covering standard practice. The examples in N. C. G. A. bulletin should be of great benefit. The discussion which followed was long and diversified. Mr. Wagner, of Cleveland, told his experience. Messrs. Ware and Hare hoped all would take suggestion home to study. Mr. Roper spoke from a manufacturers viewpoint, and said that there should never be a meeting without an exhibition. Mr. Elcock was of the opinion that meter readers should distribute advertising matter without extra pay, with which Messrs. Hewitt, Hare and Norcross agree. Mr. Barnitz says 70 per cent. of meters in New York are set in cellars, and extra time spent by meter readers would make it too expensive. The report covers many forms of local advertising, but says nothing about the value of a good show room with appliances connected for demonstrations.

Mr. C. W. Hare than read the report on National Advertising Campaign, covering its first 5 months. Twelve magazines were used with an average circulation of 9,000,000 and reaching, so they say, 45,000,000 readers. Booklets and stickers are also ready for sale to companies at reasonable cost. Thirty thousand replies had been received from advertising, and the Committee claims some of the increase of output was due to the campaign. Appeal was made for moral and financial help. Mr. L. F. Blyler described competitive conditions in Minneapolis; Mr. Macbeth fired some telling shots by asking how many companies had adequate well-stocked show rooms, and could supply any or all of the appliances advertised in the National Campaign. Messrs. Roper, Hewitt, R. R. Young and Elcock gave their views, and the discussion closed by Mr. Pettes urging all to ask their directors for subscriptions to the campaign, and not to rest until they get them.

The session closed with an interesting address on "Education", by Mr. Tolles, who kept his audience closely interested until 6:30, and at the close received an ovation.

Thursday Morning Session.—Although the registration shows only about 500, the time taken in discussions has held over reports and papers, so that the Convention will be late in closing to-morrow. To day's proceedings opened with a report of the Window Display Committee, presented by J. P. Zingg, showing, by slides, various displays used in Philadelphia. He dwelt on the importance of proper lighting of displays, and others who spoke suggested that prices be placed on articles exhibited. Messrs. Wells, Barrows, and Hanlan made suggestions. Mr. Macbeth made a point that when merchants used gas for window-lighting, to advertise that fact. Mr. Schmeltz, of Detroit, uses a motion-picture machine in his window, showing the interior of a house fitted throughout with gas appliances.

The second paper, by W. A. Morris, on "Securing Residence Lighting," told many interesting things his company had done. Eighty per cent of the 16,000 population of Wilmington use gas for lighting. All agreed paper encourages gas men to go after that business. Mr. Hewitt's paper on "Maintenance," followed, and the 2 papers were discussed together. The Toronto company's maintenance is free, and the average cost is 8 cents a call for 3 calls per year. Messrs. Rogers, Schutt, Myers, Wells, Harris, Macbeth, Wrightington, Barnitz, Harraden, Pierce, Newman and Norcross took part in the discussion, which was mainly asking questions of the authors.

Thursday Afternoon Session.—With three reports behind schedule the afternoon session began with Mr. Geo. S. Barrow's report on Heating, Ventilation and Refrigeration, which was immediately followed by Mr. Dodson's paper on All-Gas-Kitchens; and a report of committee on Domestic Fuel Appliances presented by J. J. Burns. The three were discussed together, and aroused keen interest.

Then came unexpected relaxation. DeWolf Hopper was announced, and for half an hour he amnsed us, closing with "Casey at the Bat."

The session was brought to a close with the paper on Accounting, by A. P. Post; and Report of Accounting Committee read by Mr. J. D. Shattuck.

Industrial Fuel Sessions.—Wednesday morning's industrial session, Mr. H. O. Locbell, Chairman, proceeded at once to business. The first paper, by I. L. Meyfarth, on "Recovering Heat from Flue Gases," detailed laboratory tests made to scientifically determine the waste heat carried off by over-ventillation. They showed that 25 per cent. of the heat in the burned gases could be recovered. Messrs. Karshner, Watson, Macsweeney, McKee, Burr, Hooley, Cauley, Yanders, Bridge, Loebell and Walker discussed the paper, and many valuable points were brought out. It was conceeded that specially jacketed water heaters would have to be designed if used in range flues; and that auxilliary thermostatically controlled heaters would be necessary, as the heat recovered in the flue would not meet the demands for hot water at all times. Mr. Walker said flue loss could be reduced to a point not worth considering by proper flue construction and damper regulation. The second paper, by C. L. Henderson, on "Increasing the Efficiency of Gas Fired Furnaces," was most valuable and on a subject daily becoming of more importance because of electric and other fuel competition. Mr. Hooley said the Standurd Oil Company had a research engineering department to develop fuel oil furnaces of the recuperative type, indicating their appreciation of the importance of the subject. These furnaces will make competition difficult unless gas men have more efficient appliances to offer. Mr. McKee stated that he developed a recuperative furnace 12 years ago, but although described at gas conventions he had had only two requests to build; showing apparent indifference of the gas industry. Emphasized that such furnaces necessarily involved spécial engineering, were expensive and required high grade salesmaship to sell them. Mr. Rahn had no trouble in getting installations of small gas-fired furnaces, but failed to get the larger furnaces because of high first cost. He believed recuperative furnaces of the larger sizes not only desirable, but necessary, if big business was to be obtained. The Rockwell Company built a fuel oil forge with recuperative features. Mr. Conly said when his company discovered they were losing business from large consumers due to gas fuel being superseded by oil and coal, investigation by Mr. Zander, their engineer, led to the design of recuperative ovens and furnaces, which resulted in holding old and securing new business. Fuel savings averaging 25 per cent. were affected in many cases. There was no appreciable increase in the time required to heat the furnace, because heat recovery took place beyond the working chamber; maintenance and depreciation were no greater than with standard furnaces. Tully Wilson stated that manufacturers would supply recuperative furnaces just as soon as gas men showed they wanted them. The expense was such as to preclude going it alone.

General.—The final report will have to go over until next weeks' issue as they include too many important items to be put into a paragraph.

While the lighting of the show is not on as pretentious a scale as in former years, it is very creditable. Kenwood Parkway leading from Hennepin avenue to the Armory is lighted with Welsbach lamps on one side, and Humphrey on the other; which means that the street looks "A joy forever." As usual the interior lighting is also divided between the Welsbach and the Humphrey companies. Nothing unusual about it, which means that it is good. A description of the exhibition wouid require pages, as it is as complete as the most critical could desire.

The entertainment features were well attended, especially the theatre party at the Orpheum on Wednesday evening; and the Industrial Fuel Dinner at the Radison on Thursday night.—C. H. W.

BRIEFLY TOLD.

COMMERCIAL MEN AS GENERAL MANAGERS.—The larger aspects of President Young's message to the Commercial Association brings forcibly to our attention the position of the Commercial man as the Agent, or Representative of the Company in its dealings with the public; and in this day the man who meets the public is the manager, in the eyes of the public.

That the commercial man can hope to become manager is shown by the advancement of a number of men with commercial training to that position; but it is not to be supposed that the fundamentals of the engineering side of the business were lacking in these cases. A comprehensive knowledge of gas engineering is essential to the manager, and we are glad to note that much of the matter covered by the new three-year Commercial course includes these requisites. The earlier courses largely lacked this feature, and have been successful in proportion to the engineering data which they contained. The gas business is an engineering profession, and the future managers will have engineering knowledge as have their predecessors. The possibilities of the commercial man are, however, much better to-day than ever before, and we expect to record many advancements from their ranks.

(*Continued from page 359.*)

INSPECTION.

A thorough inspection of all parts of every holder, from tunnel to crown, should be made at least every 6 months, by men competent to pass upon their general condition. The persons making these inspections will, of course, depend upon the organization and the size of the company, but where any considerable number of holders are under control of one engineer, the inspection should be delegated to one man, whose sole duty is their care and maintenance. He must be a practical man, and report to his superior the details of his findings.

Printed forms of reports, covering every part of a holder, have been adopted by one large company, printed on heavy manilla paper, and bound in a canvas cover. The inspector makes entries on these blanks, and upon the completion of the inspection of a holder, turns in his report to the office, where a copy is typed for an office record, which the inspector signs; after which he receives his original copy again for use in directing repairs.

After this preliminary report, the superintendent or engineer in charge makes a final examination of special points brought to his attention, and passes upon the recommendations for renewals, repairs, etc. The holder inspector can also have general supervision over repair and painting gangs.

In addition to the semi-annual inspection, examinations should be made at stated periods to ascertain the general condition of holder structures, as to allignment, levels, etc.

(To be Continued.)

Gas Rates.

Specific Examples of the Benefits from Scientific Rates Suggests a Rate Based on Use, Not on Quantity Used.

[Paper read by MR. H. L. COLEMAN at Meeting of Empire State Gas and Electric Association.]

Long ago it became apparent to us that to obtain the maximum sales of gas in the communities served by our company, it would be necessary to adopt a schedule of rates which would place gas in the strongest competitive position with other sources of light. heat and power. It has been our endeavor to make the price of gas so low that no householder could afford to use any other fuel for cooking, heating water, burning his garbage, etc. We wanted now to bake the bread for the baker, heat the tires for the blacksmith, smoke the hams for the butcher; in fact be ready to sell gas at a rate that would get and hold the business at a profit, for more than a thousand uses.

Much of our gas sold at the straight line rate of $1 per 1,000 was an actual loss to us. We found that at least one-third of our cunsumers in one community were not paying the cost of service to them; while we were just about breakiug even on many more. Obviously, the few large consumers were bearing the losses occasioned by the large number of small consumers, and while some of our larger consumers were anxious to burn more gas, if we would quote them an attractive competitive rate, this we could not afford to do, owing to the large number of unprofitable consumers already on our books.

As a step toward the solution of the problem, we decided to put in force a schedule of gas rates along the ideas suggested by the Wisconsin Commission in the case of State Journal Printing Company vs. the Madison Gas and Electric Company. That was to divide our annual expenses into two classes of costs:

1. Those which bear relation to the number of consumers or meters; called consumers expenses.
2. Those which vary with the number of cubic feet of gas used; or output expenses.

Competent engineers were employed to analyze our costs, and especially to arrive at a fair figure for consumers expenses as this is a part of the fixed cost to the company of carrying a consumer, irrespective of whether gas is used or not. These expense items considered as wholly consumers expense were:

634A—Gas Meter and Installation Work.
634B—Work on Consumers' Premises.
636 —Repairs to Gas Mains.
637 —Repairs to Gas Meters.
639 —Repairs to Gas Appliances.
551A—Commercial Department General Labor.
551B—Commercial Department Accounting.
551D—Commercial Department Collecting.
551E—Commercial Department Meter Reading.
Interest, profit and depreciation on value of services.
Interest, " " " " " " meters.

Other expense items were divided between the two expense classes as seemed fair. The result of this investigation showed for this community an annual consumer's expense of $6.04 per consumer.

With this determined, we put in force the following rate: Fifty cents per month per meter consumer's charge, plus eighty cents per 1,000 cubic feet for all gas consumed; fifty cents minimum charge where no gas is used. This makes a simple rate to explain, is a substantial reduction to the large consumer, an incentive to the small one to increase his consumption, due to the fact that it makes gas the cheapest fuel he could possibly use, and it is not an excessive burden on the consumer who has no additional use for gas—such as small offices and the like—for in no case does it raise anyone's bill more than 40 cents a month, as we already had a 50 cent minimum under our straight line $1 rate. It also answers the politicans' demand that everyone shall be treated alike, as all pay the 50-cent consumer's charge and all pay 80 cents for gas. This rate will have a great tendency to reduce the price of gas still further, as it opens the field of maximum sales and maximum net earnings to the interest of the community at large, by bringing about a constantly lowering price, and future large consumption will benefit both the company and smallest consumer.

Backed by this low and equitable rate, our representatives are able to go out with a powerful argument for gas fuel, and results are entirely satisfactory. Gas kitchens are going in daily, coal ranges being removed entirely: real estate owners state in their ads that the property is equipped with gas kitchens; and we are getting the hotel and restaurant business, besides gas-fired boilers, bakery ovens, etc. In fact, it has helped to put gas in the strongest possible competitive position throughout its entire field. Another advantage not to be overlooked is that, by the adoption of this system of charging, many special and discriminatory rates were wiped out, and our old sliding-scale rate was done away with, which we believe to be a good thing, as it is a hard matter sometimes to explain the justice of a sliding-scale rate, unless great care has been used in its preparation. For example: We had at one time a sliding-scale rate for gas fuel in restaurants. A restaurant using over 50,000 cubic feet per month was able to obtain a rate of 75 cents per thousand for all additional gas used. There were many small ones that used gas for all their work, and could not possibly use more, and these constantly complained that the gas company was discriminating against them in favor of their competors, who were able to get the lower rate simply because of their size. Our idea of discrimation has always been that someone is injured by it, and in the case of the restaurants the sliding scale did work to the disadvantage of the little fellow in competition. In revising our rate schedules a straight line reduction would not have been of material assistance in the proper solution of the problem, as it made further reductions to the consumers on whom we were already losing money; and, furthermore, reduced the income from those who were actually reimbursing us for all this loss and gave them no incentive to increase their consumption materially, as, under the circumstances, a straight line reduction would not be enough to place gas in the strongest competitive position with other fuels. We had made straight line reductions before without any appreciable increase in sales resulting therefrom, and we had also the experience of other companies as to the large number of consumers that are being served at an actual loss. To quote from a recent publication in this connection: "For instance, it is not an uncommon thing to find in cities of considerable size, and with gas sales relatively well developed, that 18 per cent. of all consumers use an average of less than 500 cubic feet of gas per month, representing slightly over 2 per cent. of the total gas sales; that 36 per cent. of the consumers average less than 1,000 cubic feet per month, with an aggregate consumption of slightly over 8 per cent. of the total consumption; that two-thirds of all the consumers average less than 2,000 cubic feet per month, with an aggregate consumption of only 30 per cent. of the total; and that eighty-four per cent. of all the consumers use an average of less than 3,000 cubic feet per month, representing an aggregate of less than 50 per cent. of all gas sold. In other words, it frequently is found that 16 per cent. of the consumers use more than half of the total volume of gas sold." A straight line reduction often means that consumers will not use any more gas at all, but will pocket the saying by the difference in price; and is not a step in the right direction because, as mentioned before, of the tendency to increase the number of small consumers served at a loss.

It might be interesting to state here some of the objections raised

by those opposed to this new scheme of charging. I quote from a letter to a local paper signed "A Citizen," as follows: "Stripped of its screen of superfluous words, the proposition is simply this: To approximately double the present gas rates for the poor, and about halve the rates for the rich. Burn more gas whether you need it or not. Whether you can afford it or not; "Burn more more gas" is the cry. The poor answer: "We are already burning all we can pay for." The rich say: "Why, we have always burned all we care to." Then comes the bribe: "Burn more anyway, we will make it worth your while." The poor cannot burn more, the rich can. To put a premium on wastefulness, extravagance and selfishness is folly, etc." A consumer complained that the 50 cents per month was an imposition on the small consumer, and a scheme for increasing the gas company's income materially, since, as he stated, "there are ten times as many small users of gas as large ones." On the other hand, many consumers publicly took the other side of the case, and I quote from one public letter which states: "There is no reason for criticism like that from 'Small Consumer.' To a business man the new schedule must appear fair at first sight. The expense of serving gas to consumers, including items of bookkeeping, meter reading and all similar charges, is the same in all cases of either large or small consumption. These matters should be distributed equally, just as is provided for in the new arrangement. The parcel post system might also be criticized because the rate for the first pound is 5 cents, and for the second only 1 cent additional. The cost of delivery is the same for the 6 pound package as for the lighter one. I fail to see any injustice in the new gas rate. It seems to me fair and incapable of increasing the cost of even the smallest consumer to any important degree."

Probably the hardest thing we had to contend with was making clear the justice of the 50-cent per month charge. It necessitated the employing of competent representatives to go out among the consumers and explain the reason for the charge; and, at the same time to discuss with them their present cooking costs with coal, and to call their attention to the many other uses they must have for gas. We may add here, that by this discussion of the rate by our representatives and the newspapers, a vast amount of publicity was obtained. People who had never before thought of the points brought up, started to analyze costs in their own cases; and it was of inestimable value to our new business department. This missionary work has been going on for some time, and the results are eminently satisfactory; it is not such a difficult task to show the householder a very substantial saving, comparing the cost of gas for fuel under this new schedule, with the cost for other fuel doing the same work. The task is not so easy, however, when it comes to dealing with offices, which have very little use for gas, especially during the summer months. There are a great many of these in our towns that use less than 100 feet a month from May to October, and, of course, they have no way of using any more even as a substitute for something else, except perhaps in certain cases by heating for a longer time in the fall and late spring.

In another town, we installed a similar system of charges, the rate being 50 cents per month per meter, consumer's charge, plus 90 cents for gas. This is an exceptionally low rate for a town of 7,000 inhabitants. It might be well in passing to add that this town has a very live Board of Trade, which took up the matter of gas rates, and, after investigation, gave a very full report in favor of the rate, and voted thanks to our company. Recently we put in force in still another community, a village of about 5,000 population, the same rate, 50 cents per month per meter, consumer's charge, plus 90 cents per thousand for gas, with no objections except from a few small consumers, but as fast as we are able to interview them we are overcoming their objections. The newspapers in both of these places being heartily in accord with the new rate, are assisting us materially in explaining points as they come up.

In summing up the working of the foregoing system of rates we have:

1. That straight line rates are economically wrong.
2. Maximum sales depend on competitive position of gas.
3. Unprofitable consumers are made to pay, at least what it costs to serve them.
4. The profitable consumer is relieved of the burden of the unprofitable one.
5. Reductions in rate are based on total net revenue, instead of the haphazard methods previously employed.
6. Lower rates made possible, benefiting the whole community.
7. New business acquired more easily, and at less cost.
8. A better standing before the Public Service Commission, as the rate is on a scientific basis.
9. Better relations with the public.

Many other advantages might be named but that would take too long.

This brings us to the second part of the paper, handled separately under the title of Special Rates for Special Uses.

Special Rates for Special Uses.—The fundamental principle for rate making should be that rates must be low enough, for each class of business; considering competition, or what a particular class of business can afford to pay. We may not subscribe to the theory uttered by some railroad man, that rates are made according to what the traffic will bear, but we must admit that rates cannot be higher than the traffic will bear or we lose the business. A schedule of rates which does not get the business, no matter how scientifically made, is obviously useless. Rates for gas and electricity are more analogous to railroad freight rates than to other classes of rates. The railroad sells transportation—we sell gas. It costs the railroad no more to haul a car of coal than it does a carload of crushed stone or sand; yet on all railroads the rates for the latter are lower. Transportation of a particular commodity in units of transportation (the carload) is analogous to furnishing gas for a particular purpose, and in the case of freight rates the law requires the same rate on a particular commodity to all persons, regardless of the number of carloads shipped. Our laws would brand as rank discrimination the charge of one rate for a single carload, and a lower one for a thousand carloads of the same commodity. Gas and electric men, on the other hand, seem to think it perfectly proper to have a scale of price according to quantity used. It seems to us rates based on this theory are manifestly discriminatory.

Why should a druggist who has a big store get a lower rate than the small druggist across the street who uses less gas? Why should the big dry goods store get a lower rate than his small neighbor in the same business? This is a clear discrimination in favor of the big user; the same as a lower rate of freight on iron to the United States Steel Company, than to the small manufacturer of iron, would be discrimination. On the other hand, a lower rate for gas supplied to a baker for baking bread than to a big dry goods store for lighting, even though the dry goods store uses more gas, would not be discriminatory. From a common sense point of view, this is clearly so. It does not injure the dry goods man that the baker has a lower rate; but it would injure him if another dry goods store had a lower rate. This is true also from a legal point of view.

Courts and Public Service Commissions have upheld low rates for special uses. Judge W. D. Noyes, of the Court of Common Pleas of Connecticut, says:

"Any service which pays a profit over the actual cost of performing is worth doing. Any rate which returns a surplus over the expense of earning it is justifiable, although such rate, if applied to the whole traffic, would be ruinous. It is worth while to obtain even the smallest contribution towards fixed charges, if the business can be obtained upon no other basis than the cheap rate, and other business will not be driven away by granting it."

Dr. A. T. Hadley says: "Any rate which will more than cover the expense of moving the cars and handling the goods, is a paying rate; provided the business can be had on no other terms."

The United States Supreme Court, in affirming the decision of the Interstate Commission, in Commission *vs.* Western and A. R. Co., 93 Fed., Rep. 83, says: "If the competitive rates are something more than the additional cost of the movement of the traffic, it is to the interest of the carrier and to the interest of the public, that the carrier should be allowed to compete for the traffic. The profit, however small, to the extent that it incurs, increases the revenue of the carrier, and has a tendency to reduce local rates and to improve the local service. There may be a wide difference between a rate, or amount of compensation, that would give full remuneration for the service in carrying the competitive traffic, and that remuneration therefore, which the competitive conditions will allow the carrier to receive."

The Public Service Commission, Second District, New York, in the case of Whedon *vs.* N. Y. C. & H. R. R. C., Aug. 29, 1911, says: "It is a sound principle in rate making, and well recognized by every government and other authority having control of such matters, that it is permissible, as well as good policy, for a railroad company to accept low rates on traffic which can be obtained only in that way. Traffic carried at such rates may be, and often is, unremunerative, in the sense that its contribution to the general expenses of the company is inadequate; but so long as it contributes anything at all, it may be worth the company's while to carry it. It is to the advantage of a company to handle a given traffic if it receives therefore a sum but slightly in excess of the 'out-of-pocket' expenses attributable to that particular traffic, provided it could not be obtained otherwise. There is no dissent from the provision

that a railroad must afford an exceptionally low rate when it meets in competition a water carrier, or lose the business. Such a rate is lower than the general level of rates obtaining where such water competition does not exist, but no one has ever supposed that this fact alone constituted grounds for claiming that such other rates were excessive. If it were held that the existence of the low water competitive rates were excessive, one of two results would necessarily follow; either the competitive water profit would have to be lost, or all rates would have to be reduced to the level of water rates. The latter, as is well known, could not be done without ruin, since it is not possible for a railroad to carry all its traffic at rates which can be afforded by a water carrier. On the other hand, it can afford to carry some of its traffic at water rates, provided these rates will bear the direct expense assignable to such traffic and a little more, rather than to lose it."

There is a large amount of business that can be obtained by gas and electric companies in both fields, and which can only be obtained by making special rates for special uses. Rates thus made are of benefit to the company, and to the community at large, because they bear a part of the fixed charges; and no scale of rates based on quantity used or on any other uniform basis will get this business. It seems that the only way to reach this business is to make rates compared to the commodity rates made by the railroads, viz.: Rates based on the uses to which the gas or electricity is put. This we have been doing for years and expect to continue. Should they be questioned in the court, we believe we could stand a much better chance of having them upheld, than the companies making a sliding scale of rates based on quantity used.

A Method for the Determination of Hydrogen Sulphide in Gas.

[Written for the Ninth Meeting, American Gas Institute, by A. B. Way.]

There may be times in a large works when the quantity of gas made will vary to a considerable extent from hour to hour, and as the proportion of sulphuretted hydrogen extracted from gas by a partially fouled purifier depends largely on the velocity of the gas, it is a difficult matter to determine the relative efficiency of a number of boxes unless the samples of gas are taken simultaneously. To do this by the old methods where the gas was passed through some absorbing agent and metered, would require a number of meters and absorbing trains. Besides the cost of apparatus for, say, a dozen samples, the setting up and running of the twelve determinations at one time would keep a man fairly busy. It was such a contingency as this that impelled the writer to devise the method which is about to be explained.

The apparatus used consists of a large, wide mouth bottle of about ½-gallon capacity; the neck fitted with a 3-hole rubber stopper marked, in any convenient way, so that one may be sure of its being inserted in the neck of the bottle to exactly the same point each time. Two glass tubes project through the stopper, about 2 inches above and to unequal distances below; one nearly to the bottom of the bottle and the other only a short distance below the stopper. A thermometer is inserted through the third hole. Short, stout rubber tubes with pinch cocks are attached to these tubes, and the bottle is calibrated at 60° F., including the tubes up to the pinch cocks.

The gas to be examined is passed through the *dry* bottle until all the air is expelled, and the stop cocks are then closed, the outlet one first, which insures pressure in the bottle. The sample is taken to the laboratory and allowed to stand until its temperature approaches that of the room.

One of the tubes is then connected with a longer rubber tube, the loose end of which is immersed in a vessel holding exactly ¼-inch of water. The pinch cock on this tube is slowly released until bubbles cease to rise through the water. The gas in the bottle may then be considered as being at normal pressure, for the pressure exerted by the ¼-inch seal is only about 0.06 per cent of the volume. The pinch cock is closed, the temperature noted, and the tube connected to a leveling bottle. The other tube is connected to a large burette containing an ammoniacal cadmium chloride solution.* By means of the leveling bottle a slight vacuum is produced in the sample bottle, and about 30 cubic centimeters of the cadmium solution allowed to run it. The pinch cock is closed and the burette disconnected. The leveling bottle is raised, and the pinch cock opened, and the gas which had been drawn out is forced back into the bottle. The leveling bottle is disconnected and the bottle containing the sample and cadmium chloride is shaken for a minute or two. Pressure is slowly released by opening the stop cock on the shorter tube, the stopper removed and the contents of the bottle poured onto a dry filter.

The bottle is rinsed three times with a little water without attempting to clean out the particles of cadmium sulphide which stick to the bottle and tubes; the precipitate on the filter is washed twice with water and the filter and precipitate are placed in the bottle. An excess of 1/20 normal iodine solution, 3 cubic centimeters of starch solution, about 200 cubic centimeters of water and 50 cubic centimeters of commercial hydrochloric acid are added. The stopper is inserted, the pinch cocks closed and the bottle shaken for a minute or two. The stopper is again removed, the tubes rinsed into the bottle, and the excess iodine is titrated with 1/20 normal thiosulphate solution. By calculation from the calibration of the bottle, and the absolute strength of the iodine solution, a factor is obtained which reads directly into grains of H_2S per 100 cubic feet of gas per cubic centimeter of iodine solution. A correction is made for temperature, and, if desired, for the pressure due to the ¼-inch seal. A blank is run every few days on the reagents used, and the amount of iodine used in the blank is deducted from the iodine used in the determination.

The advantages of the method are that there is no action on the iodine by anything but H_2S, as is the case when iodine is added directly to the gas; no meter is necessary, and the number of determinations that can be made simultaneously is limited only by the number of calibrated bottles at hand.

The writer has taken twelve samples simultaneously from as many purifiers, and finished their determinations in less than two hours. Duplicate determinations checking within ½ per cent. are of daily occurrence.

Following is an example of the method of calculation:

An N/20 solution of iodine contains 6.346 grams of iodine per liter.

From the reaction $H_2S + 2\,I = 2\,HI + S$, 1 gram of iodine is equivalent to 0.13,428 gram of H_2S.

Therefore

1 cc. N/20 iodine solution = 0.00,085,214 gram or 0.01,315 grain of H_2S.

Then

$$\frac{\text{Cc. in 100 cu. ft.}}{\text{Cc. in bottle}} \times 0.01315 =$$

grain H_2S per 100 cubic feet per cc. N/20 iodine.

Assuming for instance that the bottle holds 2,000 cc. we have

$$\frac{2{,}831{,}677}{2{,}000} \times 0.01315 = 18.618$$

or 1 cc. iodine solution = 18.62 grains of H_2S per 100 cubic feet of gas.

*Ammoniacal cadmium chloride solution.
125 cc. water.
20 grams cadmium chloride.
50 cc. strong ammonia.
Filter into bottle.
300 cc. strong ammonia.
Fill to 1 litre with water.

Electrolysis of Reinforced Concrete.

The cause of the cracking of reinforced concrete when the reinforcing material discharges current into it, has been found to be the formation of rust upon the anode. The Bureau of Standards found that this formation of rust takes place only at temperatures around 100° F., and that damage to the concrete is therefore not to be expected unless the density of the discharge is very high, or some other conditions keep the concrete above the critical temperature.

The addition of a fraction of 1 per cent. of salt to concrete increases its conductivity and destroys the passivity of the iron, thus multiplying the corrosion many hundred times. Salt should, therefore, never be used in structures that may be subject to electrolytic action. The passage of current from the concrete to the reinforcing material causes a softening of the bond between the iron and the concrete due to the accumulation of alkali there. The danger from electrolysis of concrete is greater where the current flows to the reinforcing material than where it flows from the metal to the concrete.

The passage of a current through unreinforced concrete has no effect upon the concrete other than that produced by the heating effect of the current. Electrolytic corrosion seems to be independent of the quality of the iron.

Correspondence.

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

A Tribute to Forrest E. Barker.

CAMBRIDGE, MASS., Nov. 30, 1914.

To the Editor, AMERICAN GAS LIGHT JOURNAL: I enclose herewith a copy of a tribute to the memory of the late Forrest E. Barker, Chairman of the Massachusetts Board of Gas and Electric Light Commissioners, which has been adopted by his associates and entered on the records of the Board. It expresses so concisely and truthfully Mr. Barker's leading characteristics, and is so just a resume of his long, faithful and valuable service that I believe it will afford pleasure to his many friends and acquaintances to see it in print. Yours very truly, ALBERT M. BARNES.

"On Saturday, Nov. 21, 1914, Forrest E. Barker, Chairman of the Board, died suddenly in Washington, D. C., While in attendance, in his official capacity, upon the annual convention of the National Association of Railway Commissioners.

His associates on the Board deem it a duty on this, his funeral day, to spread on the Board's records, their testimonial to his steadfast loyalty, unfailing courtesy, patient and engaging consideration for the rights and views of his fellow members, to his almost matchless power in discussing with them the difficult and ever-fogged problems of public service regulation to illuminate the road to what was workable and just, and thereby to render a great service to consumers, investors and the Commonwealth; but, and above all, their testimonial to his inborn, ever calm and sweet modesty.

Mr. Barker, while a member from Worcester of the General Court of 1885, drafted, introduced and carried through the Legislature the bill creating the Board, the first tribunal of its kind in the history of the country, for the regulation and supervision of gas and electric light companies. Upon the passage of the Act he became a member of the Board and served continuously up to the time of his death, the last 20 years as its chairman. Without derogation to the memory of his early associates, it may be said in all truth that from the outset his was the master spirit, and that he, with his wide, clear vision, projected the Board's course, and, like a true pilot, held it on its way to the port of sane, intelligent efficiency. And in accomplishing this he, without chart or compass—for there were no precedents—announced principles in the Board's decisions so elementary and fundamental as to be generally accepted by the courts and commissions as sound in law and satisfying to the universal sense of justice. His accurate and thorough knowledge of the law, and his equally accurate and thorough knowledge of the technical and business details of the public utilities under the Board's supervision, enabled him to grasp the delicate and complicated problems arising from their relations to municipalities and the people, and to bring to their solution constructive work of a high and enduring order which has had, we are convinced, the approval and appreciation, not only of the great body of consumers and investors in the securities of our public service corporations, and all directorates that have at heart the welfare of their community as well as their companies, but also that larger public who of late years has exibited such a vital and intelligent interest in the proper regulation of public utilities. In the achievement of all this to the benefit of consumers and the safety of investors, his associates look back over the work under his leadership, carried on at times under great stress, hostile and malicious agitation, with pride and with tender personal satisfaction.

Barker! silent, deep thinker; steady, courageous pilot; master builder of a wise public policy for a proud Commonwealth; all hail and farewell!"

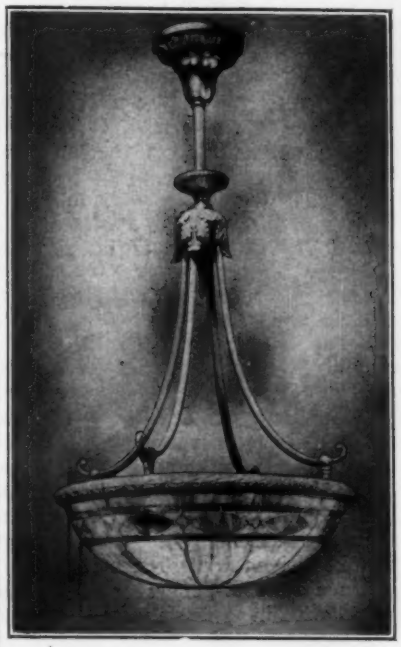
London Gas Company's Truck in War.

In the last number of the *Birmingham* (England) *Gas Department Magazine* Private E. T. Kings, of the 2nd Royal Irish Regiment, gave an account of his experiences in the battle of Mons. The following passage will interest the gas men:

"I did not get a scratch during the 4 day's fighting, but was picked out of the trenches at 3 o'clock on the morning of the 27th, suffering from hæmorrhage. A very funny thing happened here. I was placed on a lorry belonging to the South Metropolitan Gas Company, which had the price of coke in big figures on the side. In this I was taken to the hospital."

New Methods and Appliances.

AN ARTISTIC FIXTURE.—That gas lighting has more to recommend it than ever before is evident from the efforts of the leading gas fixture houses to put handsome and well-constructed designs in the hands of the gas men. The latest creation of Bayley & Sons, known as their Amber Dish, is shown in the accompanying illustration. It can be equipped with the new Welsbach horizontal "Kinetic" burner, and is especially adapted for dining rooms, as the amber-colored glass will soften the light on the table, while the light going direct to the ceiling will make the room much more cheerful than is usual with older-type domes.



TEST OF VERTICAL RETORTS AT BURNLEY, ENG.—Mr. J. P. Leather, gas enginner to the Burnley Corporation, has submitted a report to the Gas Committee on the working of the vertical retorts. In accordance with a desire expressed by the committee, gasmaking in the inclined retorts was entirely stopped during the Fair holidays for seven days. The only retorts worked during this period were six vertical retorts. This was rendered possible by the manufacture of a larger proportion of carburetted water gas. The quantity of coal used was gauged by arranging the deliveries so that the coal store was filled to the same extent at the completion of the test as at the beginning. The illuminating power was taken each morning before taking any carburetted water gas out of the relief holder. The result was as follows:

4th to 10th July, Inclusive.

Coal used	240 tons.
Coal gas made	3,084,000 cubic feet.
Make per ton	12,850 cubic feet.
Illuminating power	15.09 candles unenriched.

The weight of coke used in the furnaces were also taken, which show that only 11 per cent. of the coke made is required to heat the retorts. This is an exceedingly economical result, as the furnaces in the inclined retort house take from 17 to 18 per cent. of the coke produced.

VALUE OF A ZINC COATING.—In *L'Electricien* there is a translation from the *Zeitschrift fur Feinmechanik*, of some remarks explaining why a thin coat of zinc is the best protection against rust on iron and steel. It is pointed out that when these metals are exposed to air, a slight galvanic action is produced, consequent upon the fact that when two different metals are in contact in presence of atmospheric humidity they form a galvanic element, and slow decomposition occurs on the electro-positive element. As the electric current produced by the galvanic element is naturally very slight, its action as regards decomposition of the electro-positive metal is also slight. If iron or steel coated with zinc is exposed to the air, decomposition occurs and attacks the zinc, an electro-positive substance in relation to iron. Decomposition takes place exclusively on the zinc, while the iron remains intact. This action is always going on, whether the coating of zinc be thick or thin, the only advantage of a thick coat being that it will last longer. In ordinary atmospheric conditions, with a very small percentage of moisture, production of the galvanic reaction is very slight, and the coating will last a long time. In presence of sea water the decomposition is much faster, and then a thick coating is necessary.

THE temperatures at which certain substances in contact with atmospheric air at ordinary pressure will catch fire are as follows, says *Steam:* Lighting gas, 600° C.; benzine, 415°; petroleum, 380°; gas oil, 350°; machine oil, 380°; coal tar, 500°; tar oil, 580° and benzol, 520° Among solids it is the substance with the biggest molecules which most readily bursts into flame. As a broad rule, the nearer a substance is to a gaseous condition, the higher the temperature to which it must be exposed before it will kindle.

Items of Interest
FROM VARIOUS LOCALITIES.

JAMES H. JOURDAN, a Vice-President of the Brooklyn (N. Y.) Union Gas Company, was elected President of the company at the last meeting of the Board of Directors. The President-elect has been for many years identified with the company, of which his father, General James J. Jourdon, was President at the time of his death, 4 years ago. At the time of his father's death, Mr. Jourdan was connected with the engineering department of the company, and it may be said that he has grown up in the practical side of the business. Shortly after his father's death he was made a vice-president, and he has practically administered the affairs of the company since, in co-operation with Vice-President Arthur F. Staniford, who is in charge of the financial operations of the company. Why the presidency was left vacant so long has never been explained.

THE Laclede Gas Light Campany, St. Louis, Mo., has completed plans for building a 1,000 kw. electric station to supply energy for a new 56-oven gas works. Two Westinghouse 500-kw. 4,150-volt, 3-phase, 60-cycle tubor-generators will compose the prime mover equipment, and the steam end of the station will consist of three 500-horse power Edge Moor boilers, with the auxiliaries. Lines throughout the plant will be laid in underground ducts. Most of the motors will operate on alternating current at 400 volts, but the gas-oven-charging machines will be driven by 240-volt direct-current motors, receiving energy from a motor-generator set. It is expected that the plant will be placed in operation some time in July, 1915.

DIFFICULTIES are being experienced in England, both in gas works and coke-oven plants, in the disposal of residuals. Ammonical liquor is difficult to dispose of since the usual buyers have been compelled to stop the manufacture of their various products, and have not sufficient storage room to accommodate the bulk of liquor offered. Those who make sulphate in their own works are in a rather more favorable position. Even though sulphate is not selling well just now, it is not a difficult matter to store it in large quantities, except that a large amount of money is soon locked up in stock. The sale of tar, too, is difficult. Again, lack of storage accommodations is an important factor, the large distillers having had to restrict their operations, owing to the embargo placed upon the export of creosote, and to the fact that the demand for pitch is below normal. As far as benzol is concerned, no difficulty is reported. Its increasing use as an automobile fuel has created a good market, particularly noticeable as soon as there is any talk of a gasoline famine.

J. R. MCCLURE, JR., who for the past five years has been prominently associated with public utilities, was elected on November 16th to the Presidency of the First Mortgage Guarantee and Trust Company of Philadelphia. Mr. McClure is President of the Wildwood Gas Company, Vice-President of the New Jersey Water Service Company, and Secretary and Treasurer of the New Jersey Gas Company, the Pottsville Gas Company, and the Schuylkill Haven Gas and Water Company. For the present he will retain his connection with the named utilities.

THE Public Utilities Company of Philadelphia has taken over supervision of the Southern Gas Improvement Company from Kuemmerle & Co., and is asking the Kinston (N. C.) City Council for renewal of a franchise to erect a plant. The franchise recently died because the Southern Company failed to commence work in the time agreed upon. It is doubtful if a new franchise will be granted, although the new promoters are confident they can begin work on the proposed plant in a short time. Recently a considerable sentiment for a municipally-owned plant has developed.

IT is reported from Virginia (Minn.) that gas will be turned into the city mains about Christmas, and not be later than that, although rumors about the city had it that the opening of the municipal plant would be delayed. All of the service connections have been completed and the applications for the use of gas have been liberal. It is estimated that over 400 will be using the new fuel from the start, and that an additional 200 will have it put in early next spring.

ON Monday last the City Council of Peru, Ills., voted 9 to 1 to shut off gas furnished by the Citizens' Lighting Company, as the final action in a long franchise controversy. Sufficient time to allow the citizens to accustom themselves to the change will be given and this will probably be 2 weeks. The company involved offers no statement as to their probable action, but it is expected that a fight will be launched against the council's action. The formal transfer of the holdings of the Peru Water Works Company to the City of Peru was made at this meeting.

THE Worcester, Mass., city council committee on street lighting has recommended to city council the adoption of an order authorizing the mayor and superintendent of street lighting to make a contract for street gas lighting. The present contract expires this year, and the new one will probably be on the same terms as the one now in force. The contract will call for lights of the Welsbach boulevard type.

C. R. HEATH has bought the artificial and natural gas plant at Vincennes, Ind., the transaction involving an investment of $250,000. In the organization of the new company, Mr. Heath was chosen President; L. B. Darrah, Vice-President, and J. L. Bayard, Jr., President of the First National Bank, at Vincennes, Secretary and Treasurer. The new company contemplates remodeling the plant at a cost of $150,000. The policy of the company will be directed by Mr. Heath, and Mr. Darrah will be resident manager. Mr. Heath is Vice-President of the Indiana Gas Light Company, which supplies Noblesville and Tipton with natural gas, and President of the Middletown Gas Company.

BARTON HEIGHTS, Highland Park and Ginter Park, suburbs of Richmond, Va., now using gas furnished by a private concern, will soon ask the city to extend its mains to them and supply gas at the rate now paid in the city. The suburbs are paying much more than the city is exacting, and the demand is that all residents shall be placed on the same footing. The territory is now getting the benefits of the water rates in Richmond, and there is little reason why the gas mains should not be extended at once and gas supplied. The new sections will go before the Council at an early date and lay the situation before that body and ask for relief.

A LARGE number of Geneseo (Ill.) citizens have signed a petition urging the establishment of a municipal electric and gas plant. The franchise of the company now doing business there will expire in 1917.

MAYOR ELLIS, of Grand Rapids, Mich., has written a letter to the American Light and Traction Company of New York, which owns the Grand Rapids Gas Company, reminding them that the gas company's franchise expires in five years and asking them if they will not reduce rates in Grand Rapids. The Mayor declares that it is customary for corporations to share their profits with the public, either by dividends paid to the city or lower rates. Although the gas company has a franchise which does not require any profit-sharing, Mr. Ellis believes that the company will grant the request in order to create more friendly relations with the public. The gas company lowered its rates a few years ago, and has donated property to the city for park purposes. The Mayor declares it is one of the most public-spirited corporations operating there.

"J.," WRITING from La Junta, Col., says that work on the gas plant which will furnish La Junta and Rocky Ford with gas will be commenced within a week. J. T. Updike, who has the work in charge, states that the material will begin to arrive the latter part of the week, and the work of laying the mains will be commenced at once. The plant will be located in the western part of the city between Fourth and Fifth streets. The work will be pushed with all possible speed, and it is expected that the city will be supplied with gas early in the spring.

THE Gage County Gas Light and Power Company, Beatrice, Neb., has been consolidated with the Iowa-Nebraska Public Service Company, and the two companies now occupy a joint office. Mr. Thomas Rice continues as General Manager of the gas department, and Mr. Benjamin Conlee in charge of the electric.

MILWAUKIE, Oregon's hopes of securing gas at $1 per 1,000, were revived when the council granted a 50-year franchise to the Clackamas Gas Company, a subsidiary of the Portland Gas and Coke Company, to supply gas at that rate, with a 50-cent minimum. The company may not accept, claiming that it cannot furnish gas at less than $1.25. It has 60 days to accept the franchise. The company has laid its pipe line from Portland to Oregon City, except through Milwaukie, and when members of the council insisted on the $1

rate it was rumored the company would omit Milwaukie from its route, laying pipe across the Willamette river, and cross the river again at the bridge just south of Milwaukie. It is understood that the company will cross the river to supply gas to Oswego, even if it accepts the Milwaukie franchise.

THE Administrative Board of Richmond, Va., has awarded to the Standard Oil Company a contract for furnishing oil to the City Gas Works for 2 years following the expiration of the present contract, which has 9 more months to run. The company's bid of $.0344 a gallon was the only one received. The price is $.0023 less per gallon than the city is now paying.

THE Twin State Gas and Electric Company, Brattleboro, Vt., has decided to make a reduction of 10 cents per 1,000 cubic feet of gas after January 1, for prompt payment. For large consumers a reduction from $1.60 to $1 per 1,000 is contemplated for gas used in excess of 10,000 feet per month.

THE City of Chester, Pa., has instituted suit in Media against the Philadelphia Suburban Gas and Electric Company in an effort to collect $2,173.20, with interest from July 1, 1914. The city claims this amount as the annual license fee of $40 per mile on 54.33 miles of pipe in Chester, in accordance with a city ordinance. The statement of claim filed sets forth that the city has, on several occasions, demanded this money, but was refused each time payment of it or any part of the sum.

WITHIN a few days Justice Pound of the Supreme Court at Buffalo, will decide the injunction suit of the village of Fredonia, N.Y., against the old Fredonia Gas Lighting Company. Several months ago, under a franchise granted in Civil War days, the company attempted to lay mains in certain streets to supply gas for the Fredonia Heating plant. The village trustees, declaring that the company had lost its right under the charter, started an injunction suit. W. E. Carroll, of Buffalo, is President of the company and is also President of the South Shore Natural Gas Company, which it is said has been anxious to lay its pipes in Fredonia.

THE answer of the Public Service Gas Company to the charge of the City of Trenton, N. J., that it is furnishing a poor and insufficient illuminating gas in that city, has been submitted to the Public Utility Commissioners. The company entered a general denial to the complaint, and says the standard of gas now being served is in excess of that ordered by the Utility Board. This standard was fixed in 1877. The gas company denies that a candle-power standard is either practical or reasonable under existing conditions.

THE city of Duluth, Minn., has appropriated $15,000 to be expended on gas and water main extensions.

"L. A. C.," WRITING from Glendale, Cal., says: "The city Board of Trustees has appointed a committee to place before the people the question of municipal ownership of gas. For about 6 months the Southern California Gas Company has been making strenuous efforts to cut into the pavement on Brand Boulevard and Broadway to make connections to business houses. Prior to the paving of these streets the gas company was urged to extend the pipes to the curb line. As it failed to comply with this request the Trustees now refusd to have the streets torn up. The committee will ascertain the value of the gas company's holdings, with a view to settling the question by making gas a municipal property."

MR. W. P. HICKS, of Norfolk, Va., has gone to Winston-Salem' N. C., to take charge of the coke department of the Winston-Salem Gas Company. Mr. Hicks is thoroughly acquainted with gas coke and the proper way to burn it, and he will explain to the North Carolinians the qualities of this modern fuel.

THE Cedar Rapids (Ia.) Gas Company has been furnishing a good grade of gas according to the report of Inspector L. H. Goebel, filed with the city council. It is as follows: The average heating power was 611.5 B. T. U.'s per cubic foot with a maximum value of 620.3, and minimum of 596.1. The average amount of total sulphur contained was 6.4 grains with a maximum of 7.4 and minimum of 5.76 grains. The average amount of ammonia present was 1.03 grains with a maximum of 1.09 and maximum of 0.96 grains. No trace of hydrogen sulphide was found on any day.

Utilities Commission News.

GEORGIA COMMISSION'S VIEW ON GOING VALUE AND BENEFIT FUNDS.—The commission quotes its views in the Macon Railway and Light Company case and reiterates the conclusions therein, which were to the effect that such "going value" items as are an actual element of expense of attaching business should be included under operating expenses as incurred. The decision then continues:

"As to the employees' pension, disability benefit and insurance fund, the commission are also inclined to disallow as a proper charge to operating expenses, contributions by the company to the upkeep of an employees' sick benefit, disability, pension and insurance fund."

The desire of the company to make such provision for its employees is laudable and praiseworthy, but in the absence of a mandatory statute impossing on a public service corporation an obligation or duty to provide such a fund as a matter of public policy we question its right to voluntarily assume such an obligation and transfer the burden of it to the public under the guise of a charge for service rendered it.

DISTRICT OF COLUMBIA RULES ON MAINS AND SERVICES.—New regulations governing the extension of mains and service pipes of gas companies in the District have been adopted and placed in force by the Public Utilities Commission.

It is provided that, on application of the consumer, the companies shall extend their mains 125 feet for each house to be connected, without charge to the consumer. Where extension for a greater distance is necessary, the companies shall require from the consumer a deposit of 75 cents per lineal foot of further extension, applicants to receive no interest on the deposit. Whenever additional consumers are connected to the main so extended, the companies shall return to the depositor $93.75 for each additional house served. This is the amount of deposit to cover 125 feet of extension.

It is stipulated that a gas company shall not be required to extend its mains in streets not at or near the established grade, and the order shall not be construed to prevent a company from making extensions of mains of greater length than that required in the order.

Service pipes connecting the main with the meter of the consumer shall be installed for the entire distance by the company, and one-half of the cost shall be assessed against the consumer. Companies shall thereafter maintain at their expense the entire service pipe.

The order also provides that petition may be made to the commission for special action in any case in which it is claimed that the application of the new regulations causes injustice.

IDAHO COMMISSION.—Mr. W. D. Standrod, of Pocatello, has resigned as a member of the Idaho Public Utilities Commission for personal reasons. The Commission has rendered decissions reaffirming its determination not to grant certificates of public necessity and convenience to companies to enter a field which is being adequately served by the existing company. The decisions had reference to the application of the Idaho Power and Light Company and Clear Lake Power and Improvement Company to enter the field supplied by the Great Shoshone and Twin Falls Water Power Company in the counties of Twin Falls, Gooding and Lincoln.

WAR TAX AND INDIANA UTILITIES.—Attorney-General Thomas M. Honan has given an opinion to Mr. Charles J. Murphy, of the Public Service Commission of Indiana, holding that the war-tax bill passed recently by Congress, does not effect in any way the relationship between the Commission and the utilities. Mr. Murphy had submitted to Mr. Honan the provision of the war tax measure for the payment of a 1-cent tax on telephone or telegraph messages. Mr. Honan declared that the war-tax measure is one that is to be handled only between the utilities and the Federal Government, and that it cannot in any way affect State laws regulating utilities.

VACANCY IN MASSACHUSETTS BOARD.—Gov. Walsh has a difficult problem in filling the vacancy caused by the recent death of Forrest E. Barker, Chairman of the Gas and Electric Light Commission. The remaining members of the board are Gen. Morris Schaff, of Cambridge, and Alonzo R. Weed, of Newton. Gen. Schaff was reappointed when his term expired this year. Mr. Weed's term will expire in 1915. It has been suggested that Gov. Walsh would make no mistake if he named Mr. Weed Chairman, and then filled the vacancy with a new man.

Financial Notes.

IT is announced that negotiations have been resumed between the Ohio Cities Gas Company and the Dayton Gas Company by which the former will take over the latter corporation. Previous to the outbreak of the war the deal had practically been closed, but financial conditions were so disturbed, however, that the matter was temporarily dropped. Ohio Cities Gas Company has declared the regular quarterly dividend of 1¼ per cent. on its preferred stock, payable Jan. 1 to stock of record of Dec. 15.

THE combined net earnings of the subsidiary companies of Massachusetts Gas for October were $242,780, as compared with $220,781 in 1913, an increase of $21,998. For the 4 months to Oct. 31, the net earnings for dividends were $807,631, as compared with $773,806 a year ago. Of late there has been a tendency toward increase in the earnings of the gas companies, and a decrease in the earnings of the coal companies, but during October both classes reported increases, the gas companies of $17,464, and the coal companies of $4,534; while for the 4 months the gas companies report an increase of $83,394, and the coal companies a decrease of $49,570, making a net increase of $33,824.

AUTHORIZATION of the issue and sale of $600,000 of bonds of the Washington (D. C.) Gas Light Company of the issue of November 1, 1910, certified to on December 3, 1912, by the Washington Gas Light Company, has been authorized by the Public Utilities Commission of the District of Columbia. The issue and sale was authorized in two allotments of $300,000 each on the conditions that the proceeds thereof shall be used only for the reimbursement of funds expended for the acquisition of property and for construction, completion, extension or improvement of the company's plant or equipment as specified by the company in papers sworn to and submitted to the commission with the application of the gas company. It is further ordered that the company shall make verified reports to the commission on or before January 15 and July 15 until the bonds are sold and the proceeds expended.

ON the reopening of the Chicago Stock Exchange on Nov. 23rd, People's Gas Light and Coke was quoted at 118 asked. The last sale on July 30th was at 106.

THE first and refunding bonds of the Western United Gas and Electric Company are a first lien on all the property of the company except for $63,000 underlying bonds which mature in 1917. Of the authorized issue of $5,000,000, $4,704,900 are outstanding, including bonds held to retire the underlying issue. Thus the mortgage is practically closed, as the company is doing its new financing with a $20,000,000 junior mortgage, under which $1,000,000 of general 6s have been issued. Earnings have shown an increase every year since the company was formed in 1905, and since 1907 net earnings have been more than double the interest and taxes. The company has outstanding $1,500,000 preferred and $3,000,000 common stock. Six per cent. is paid on the former. Three per cent. was paid on common in 1912, and 4 per cent. in 1913. The first and refunding bonds are in a strong position.

THE annual report of the Salem (Mass.) Gas Light Company shows these figures for operation:

Manufacturing Account.

Operating expenses (gas):	
At works	$98,797.22
Gas bought	168.54
For distribution	17,630.20
Management	19,088.69
Taxes	21,394.47
Incidentals	4,090.98
Total	$161,170.10
Income from sale of gas	209,490.30
Residuals	14,188.46
Other sources	315.25
Total	$223,994.01

Profit and Loss Account.—Cr.

Balance last year	$254,126.43
Balance of manufacturing account	62,823.91
Interest received	104.38
Rents	1,607.26
Jobbing	3,371.91
Total	$322,033.89
Dr.	
Interest paid	$16,424.91
Dividends declared	49,960.00
Depreciation	12,743.69
Other items	19,741.49
Balance	223,163.80

THE summary of the yearly report of the New Bedford (Mass.) Gas and Edison Light Company, shows these totals:

Profit and Loss Account.—Cr.

Balance last year	$493,875.67
Balance of gas manufacturing account	126,999.05
Balance of electric manufacturing account	94,851.51
Interest received	3,871.88
Rents	2,720.98
Jobbing	8,381.28
Other items of income	1,437.44
Totals	$732,137.81
Dr.	
Interest paid	$38,937.07
Dividends declared	148,400.00
Depreciation	75,000.00
Reserve funds	
Other items	4,203.67
Balance	465,597.07
Total	$732,137.81

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